MAKING MODERN LIVING POSSIBLE

Quick Guide

VLT® HVAC Basic Drive

THE REAL DRIVE

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1 Quick Guide

1.1 Safety

1.1.1 Warnings

⚠WARNING

High Voltage Warning

The voltage of the frequency converter is dangerous whenever it is connected to mains. Incorrect installation of the motor or frequency converter may cause damage to the equipment, serious injury or death. Consequently, it is essential to comply with the instructions in this manual as well as local and national rules and safety regulations.

⚠WARNING

Electrical Hazard

Touching the electrical parts may be fatal - even after the equipment has been disconnected from mains. Also make sure that other voltage inputs have been disconnected (linkage of DC intermediate circuit). Be aware that there may be high voltage on the DC link even when the LEDs are turned off. Before touching any potentially live parts of the frequency converter, wait at least as stated in the table below:

Voltage (V)	Power range (kW)	Min. waiting time (minutes)
3 x 200	0.25 – 3.7	4
3 x 200	5.5 – 11	15
3 x 400	0.37 – 7.5	4
3 x 400	11 – 90	15
3 x 600	2.2 – 7.5	4
3 x 600	11 – 90	15

CAUTION

Leakage Current:

The earth leakage current from the frequency converter exceeds 3.5 mA. According to IEC 61800-5-1 a reinforced Protective Earth connection must be ensured by means of a min. 10 mm² Cu or an additional PE wire - with the same cable cross section as the Mains wiring - must be terminated separately.

Residual Current Device:

This product can cause a DC current in the protective conductor. Where a residual current device (RCD) is used for extra protection, only an RCD of Type B (time delayed) shall be used on the supply side of this product. See also Danfoss Application Note on RCD, MN90GXYY.

Protective earthing of the frequency converter and the use of RCDs must always follow national and local regulations.

Motor thermal protection:

Motor overload protection is possible by setting Parameter 1-90 Motor thermal protection to the value Electronic Thermal Relay (ETR) trip.

⚠WARNING

Installation at high altitudes

For altitudes above 2 km, please contact Danfoss regarding PELV.

1.1.2 Safety Instructions

- Make sure the frequency converter is properly connected to earth.
- Do not remove mains connections, motor connections or other power connections while the frequency converter is connected to power.
- Protect users against supply voltage.
- Protect the motor against overloading according to national and local regulations.
- The earth leakage current exceeds 3.5 mA.
- The [OFF] key is not a safety switch. It does not disconnect the frequency converter from mains.

1.2 Introduction

1.2.1 Available Literature

This quick guide contains the basic information necessary for installing and running the frequency converter. If more information is needed, literature can be found on the enclosed cd or downloaded from: http://www.danfoss.com/Products/Literature/Technical+Documentation.htm

1.2.2 Approvals

1.2.3 IT Mains

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IT Mains

Installation on isolated mains source, i.e. IT mains. Max. supply voltage allowed when connected to mains: 440 V (3 x 380-480 V units).

On IP20 200-240 V 0.25-11 kW and 380-480 V IP20 0.37-22 kW, open the RFI switch by removing the screw on the side of the frequency converter when at IT grid.

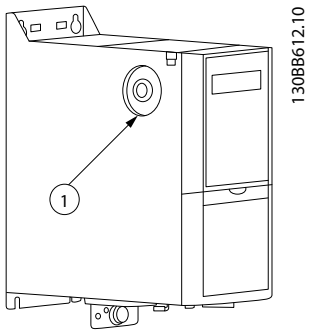

Illustration 1.1 IP20 200-240 V 0.25-11 kW, IP20 0.37-22 kW 380-480 V.
1: EMC screw

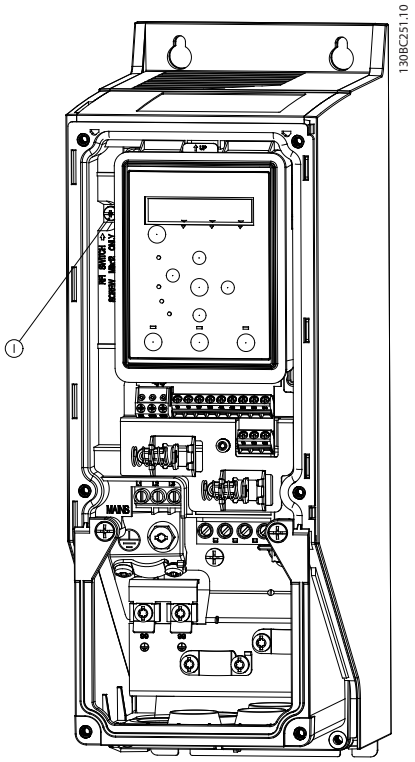

Illustration 1.2 IP54 400 V 0.75-18.5 kW
1: EMC screw

On all units, set par. 14-50 *RFI filter* to *OFF* when operating in IT mains.

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If reinserted, only use M3 x 12 screw.

1.2.4 Avoid Unintended Start

While the frequency converter is connected to mains, the motor can be started/stopped using digital commands, bus commands, references or via the LCP.

- Disconnect the frequency converter from mains whenever personal safety considerations make it necessary to avoid unintended start of any motors.
- To avoid unintended start, always activate the [OFF] key before changing parameters.

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1.2.5 Disposal Instruction

Equipment containing electrical components must not be disposed of together with domestic waste.
It must be separately collected with electrical and electronic waste according to local and currently valid legislation.

Voltage (V)	Power range (kW)	Min. waiting time (minutes)
3 x 200	0.25 – 3.7	4
3 x 200	5.5 – 45	15
3 x 400	0.37 – 7.5	4
3 x 400	11 – 90	15
3 x 600	2.2 – 7.5	4
3 x 600	11 – 90	15

1.3 Installation

1.3.1 Before Starting Repair Work

1. Disconnect FC101 from mains (and external DC supply, if present.)
2. Wait as stated in the table below for discharge of the DC-link:
3. Remove motor cable

1.3.2 Side-by-Side Installation

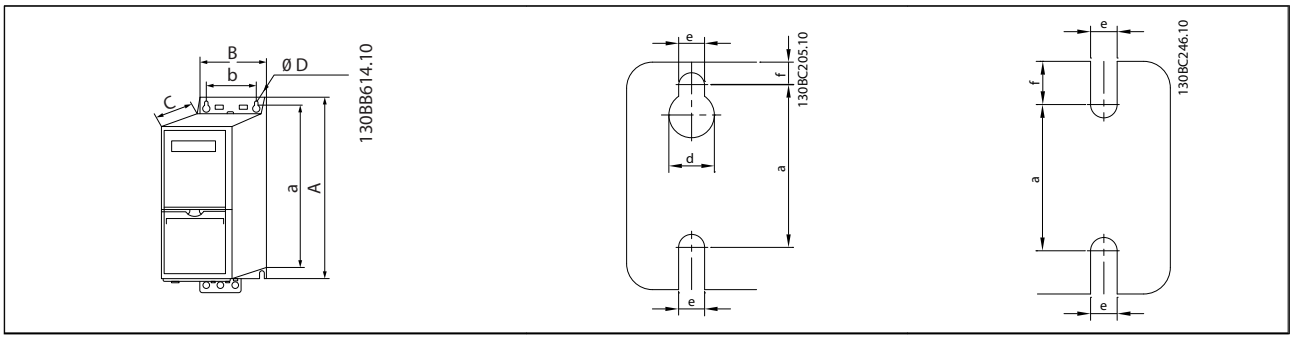
The frequency converter can be mounted side-by-side and requires the clearance above and below for cooling.

		Power			Clearance above/ below (mm/inch)
Frame	IP class	3 x 200-240 V	3 x 380-480 V	3 x 525-600 V	
H1	IP20	0.25-1.5 kW/0.33-2 Hp	0.37-1.5 kW/0.5-2 Hp		100/4
H2	IP20	2.2 kW/3 Hp	2.2-4 kW/3-5.4 Hp		100/4
H3	IP20	3.7 kW/5 Hp	5.5-7.5 kW/7.5-10 Hp		100/4
H4	IP20	5.5-7.5 kW/7.5-10 Hp	11-15 kW/15-20 Hp		100/4
H5	IP20	11 kW/15 Hp	18.5-22 kW/25-30 Hp		100/4
H6	IP20	15-18.5 Kw/20-25 Hp	30-45 kW/40-60 Hp	22-30 kW/30-40 Hp	200/7.9
H7	IP20	22-30 kW/30-40 Hp	55-75 kW/100-120 Hp	45-55ø W/60-100 Hp	200/7.9
H8	IP20	37-45 kW/50-60 Hp	90 kW/125 Hp	75-90 kW/120-125 Hp	225/8.9
H9	IP20			2.2-7.5 kW/3-10 Hp	100/4
H10	IP20			11-15 kW/15-20 Hp	200/7.9

NOTE

With IP21/Nema Type1 option kit mounted, a distance of 50 mm between the units is required.

1.3.3 Dimensions



Enclosure		Power [kW]			Height [mm]			Width [mm]		Depth [mm]	Mounting hole [mm]			Max.Weight
Frame	IP Class	3 x 200-240 V	3 x 380-480 V	3 x 525-600 V	A	"A incl Decoupling Plate"	a	B	b	C	d	e	f	Kg
H1	IP20	0.25-1.5 kW	0.37-1.5 kW		195	273	183	75	56	168	9	4.5	5.3	2.1
H2	IP20	2.2 kW	2.2-4.0 kW		227	303	212	90	65	190	11	5.5	7.4	3.4
H3	IP20	3.7 kW	5.5-7.5 kW		255	329	240	100	74	206	11	5.5	8.1	4.5
H4	IP20	5.5-7.5 kW	11-15 kW		296	359	275	135	105	241	12.6	7	8.4	7.9
H5	IP20	11 kW	18.5-22 kW		334	402	314	150	120	255	12.6	7	8.5	9.5
H6	IP20	15-18.5 kW	30-45 kW	22-30 kW	518	595/635(45 kW)	495	239	200	242	-	8.5	15	24.5
H7	IP20	22-30kW	55-75 kW	45-55 kW	550	630/690(75 kW)	521	313	270	335	-	8.5	17	36
H8	IP20	37-45kW	90 kW	75-90 kW	660	800	631	375	330	335	-	8.5	17	51
H9	IP20			2.2-7.5 kW	269	374	257	130	110	205	11	5.5	9	6.6
H10	IP20			11-15 kW	399	419	380	165	140	248	12	6.8	7.5	12
I2	IP54		0.75-4.0 kW		332	-	318.5	115	74	225	11	5.5	9	5.3
I3	IP54		5.5-7.5 kW		368	-	354	135	89	237	12	6.5	9.5	7.2
I5	IP54		11-18.5 kW		480	-	454	242	210	260	19	9	9	23
I6	IP54		22-37 kW		650	-	624	242	210	260	19	9	9	27
I7	IP54		45-55 kW		680	-	648	308	272	310	19	9	9.8	45
I8	IP54		75-90 kW		770	-	739	370	334	335	19	9	9.8	65

The dimensions are only for the physical units, but when installing in an application it is necessary to add space for free air passage both above and below the units. The amount of space for free air passage is listed in *Table 1.1*:

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Enclosure		Clearance needed for free air passage [mm]	
Frame	IP class	Above unit	Below unit
H1	20	100	100
H2	20	100	100
H3	20	100	100
H4	20	100	100
H5	20	100	100
H6	20	200	200
H7	20	200	200
H8	20	225	225
H9	20	100	100
H10	20	200	200
I2	54	100	100
I3	54	100	100
I5	54	200	200
I6	54	200	200
I7	54	200	200
I8	54	225	225

Table 1.1 Clearance needed for free air passage [mm]

1.3.4 Electrical Installation in General

All cabling must comply with national and local regulations on cable cross-sections and ambient temperature. Copper conductors required, (75°C) recommended.

Power (kW)				Torque (Nm)					
Frame	IP class	3 x 200-240 V	3 x 380-480 V	Line	Motor	DC connection	Control terminals	Earth	Relay
H1	IP20	0.25-1.5	0.37-1.5	1.4	0.8	0.8	0.5	0.8	0.5
H2	IP20	2.2	2.2-4	1.4	0.8	0.8	0.5	0.8	0.5
H3	IP20	3.7	5.5-7.5	1.4	0.8	0.8	0.5	0.8	0.5
H4	IP20	5.5-7.5	11-15	1.2	1.2	1.2	0.5	0.8	0.5
H5	IP20	11	18.5-22	1.2	1.2	1.2	0.5	0.8	0.5
H6	IP20	15-18	30-45	4.5	4.5	-	0.5	3	0.5
H7	IP20	22-30	55	10	10	-	0.5	3	0.5
H7	IP20	-	75	14	14	-	0.5	3	0.5
H8	IP20	37-45	90	24[2]	24[2]	-	0.5	3	0.5

Power (kW)			Torque (Nm)					
Frame	IP class	3 x 380-480 V	Line	Motor	DC connection	Control terminals	Earth	Relay
I2	IP54	0.75-4.0	1.4	0.8	0.8	0.5	0.8	0.5
I3	IP54	5.5-7.5	1.4	0.8	0.8	0.5	0.8	0.5
I5	IP54	11-18.5	1.8	1.8	-	0.5	3	0.6
I6	IP54	22-37	4.5	4.5	-	0.5	3	0.6
I7	IP54	45-55	10	10	-	0.5	3	0.6
I8	IP54	75-90	14/24[1]	14/24[1]	-	0.5	3	0.6

Power (kW)			Torque (Nm)					
Frame	IP class	3 x 525-600 V	Line	Motor	DC connection	Control terminals	Earth	Relay
H9	IP20	2.2-7.5	1.8	1.8	not recommended	0.5	3	0.6
H10	IP20	11-15	1.8	1.8	not recommended	0.5	3	0.6
H6	IP20	22-30	4.5	4.5	-	0.5	3	0.5
H7	IP20	45-55	10	10	-	0.5	3	0.5
H8	IP20	75-90	14/24[1]	14/24[1]	-	0.5	3	0.5

Table 1.2 Details of Tightening Torques

[1] *Cable dimensions ≤ 95 mm²*

[2] *Cable dimensions > 95 mm²*

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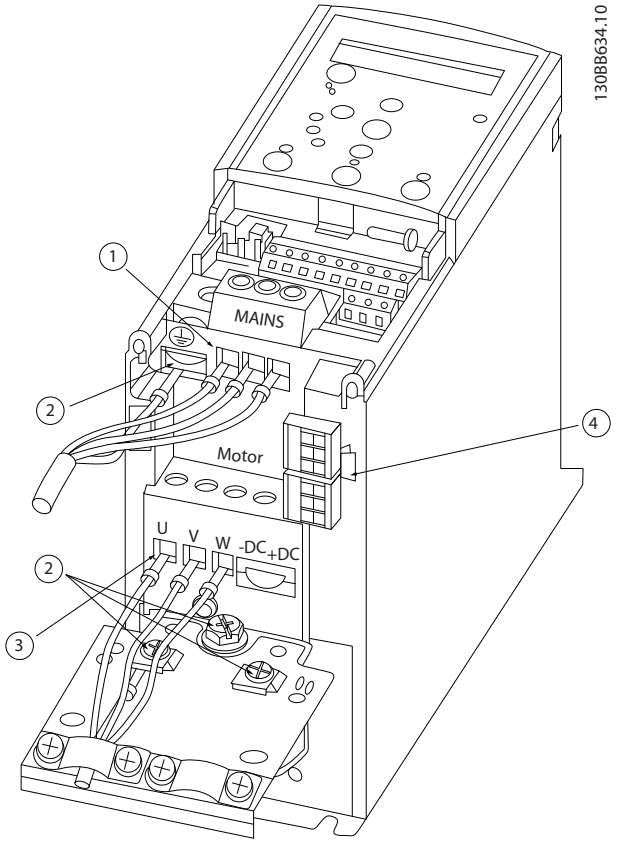
1.3.5 Connecting to Mains and Motor

The frequency converter is designed to operate all standard three-phased asynchronous motors. For maximum cross-section on wires please see section *1.7 General Specifications*.

- Use a shielded/armored motor cable to comply with EMC emission specifications, and connect this cable to both the decoupling plate and the motor metal.
- Keep motor cable as short as possible to reduce the noise level and leakage currents.
- For further details on mounting of the decoupling plate, please see instruction MI02QXYY
- Also see *EMC-Correct Installation* in the Design Guide, MG18CXYY.

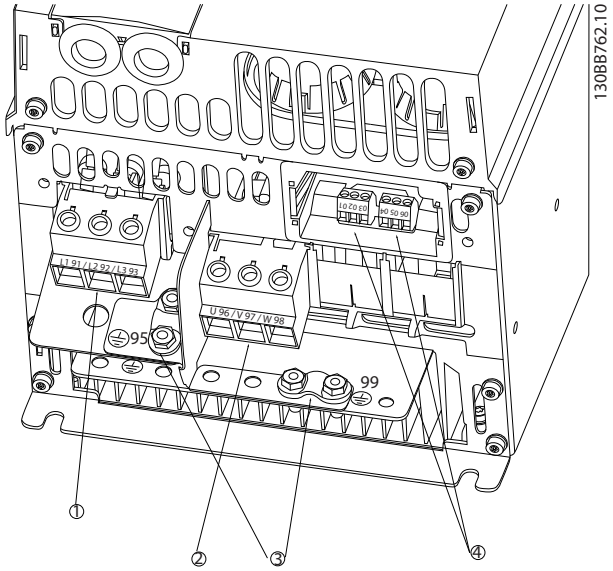
1. Mount the earth wires to earth terminal.
2. Connect motor to terminals U, V and W.
3. Mount mains supply to terminals L1, L2 and L3 and tighten.

H1-H5 Frame
IP20 200-240 V 0.25-11 kW and IP20 380-480 V 0.37-22 kW.



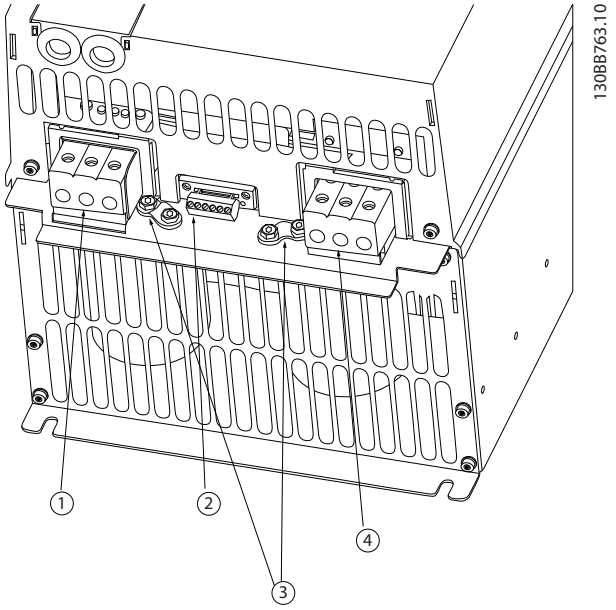
1	Line
2	Earth
3	Motor
4	Relays

H6 Frame
IP20 380-480 V 30-45 kW
IP20 200-240 V 15-18.5 kW
IP20 525-600 V 22-30 kW



1	Line
2	Motor
3	Earth
4	Relays

H7 Frame
IP20 380-480 V 55-75 kW
IP20 200-240 V 22- 30 kW
IP20 525-600 V 45-55 kW



1	Line
2	Relays
3	Earth
4	Motor

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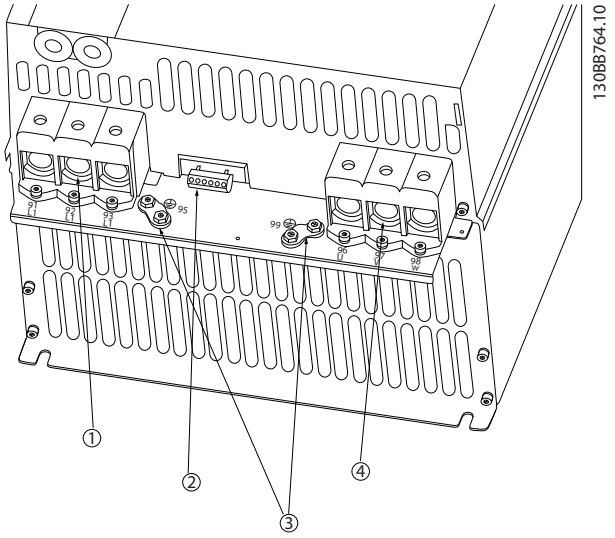
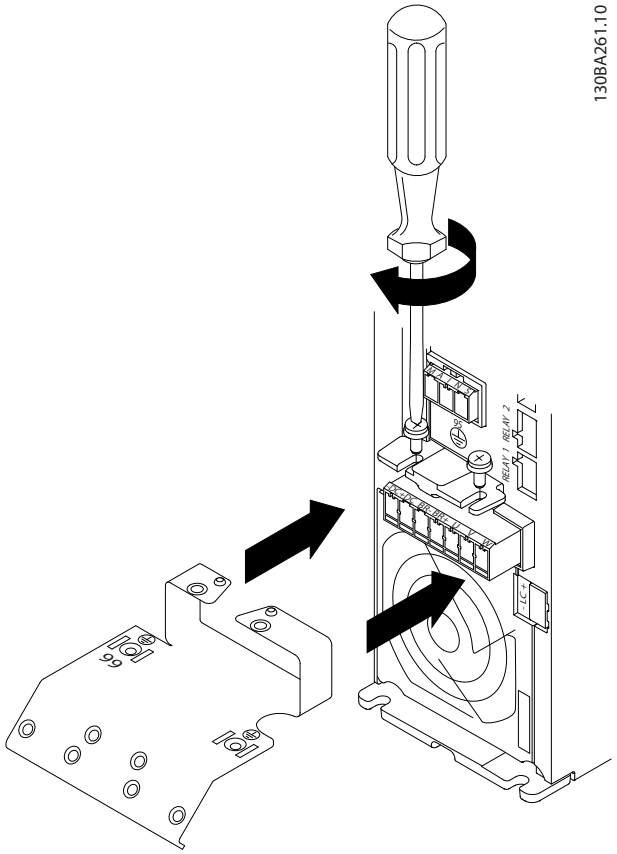
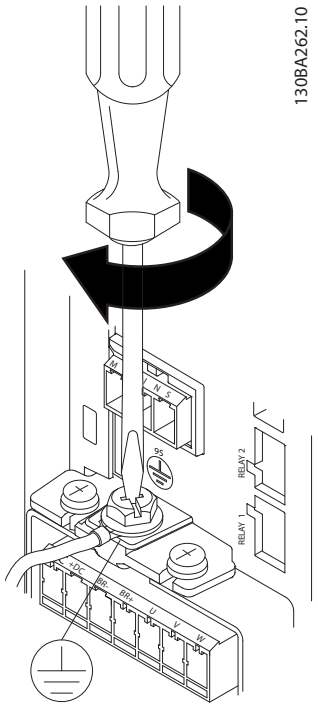
H8 Frame
IP20 380-480 V 90 kW
IP20 200-240 V 37-45 kW
IP20 525-600 V 75-90 kW

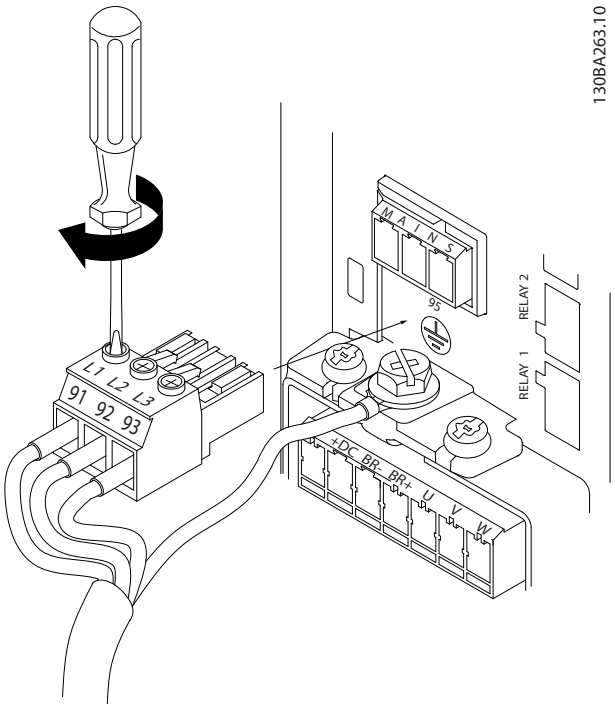


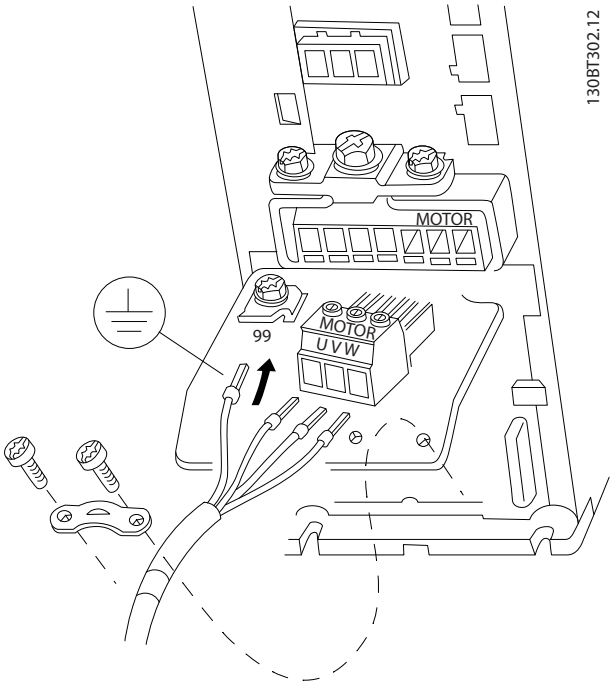
1	Line
2	Relays
3	Earth
4	Motor

H9 Frame
IP20 600 V 2.2-7.5 kW

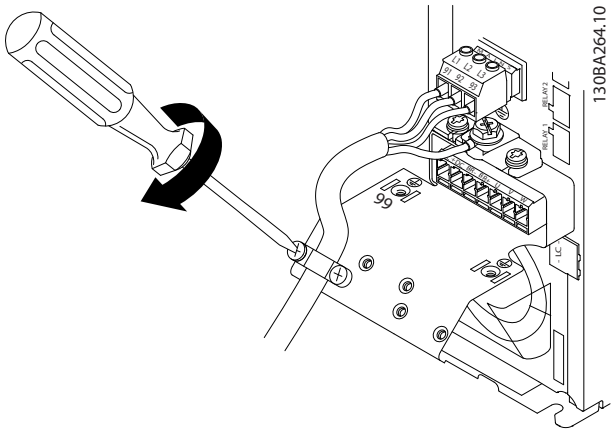


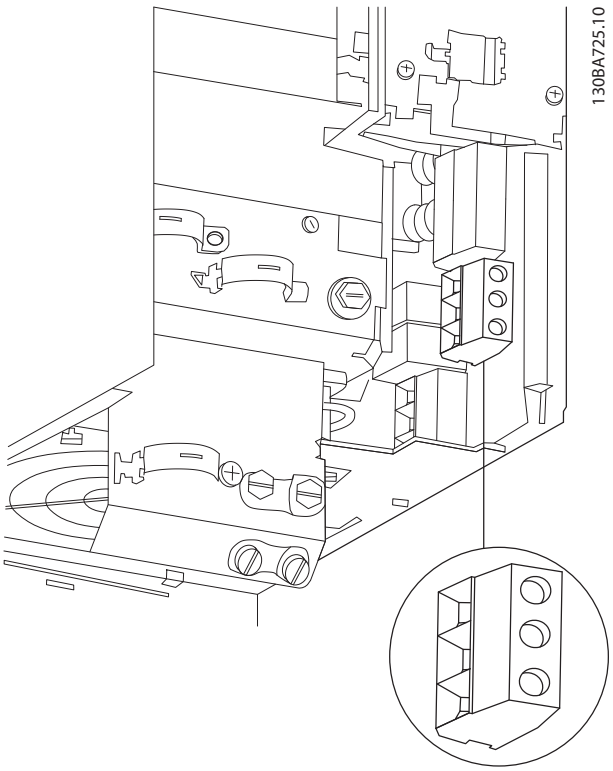






H10 Frame
IP20 600 V 11-15 kW





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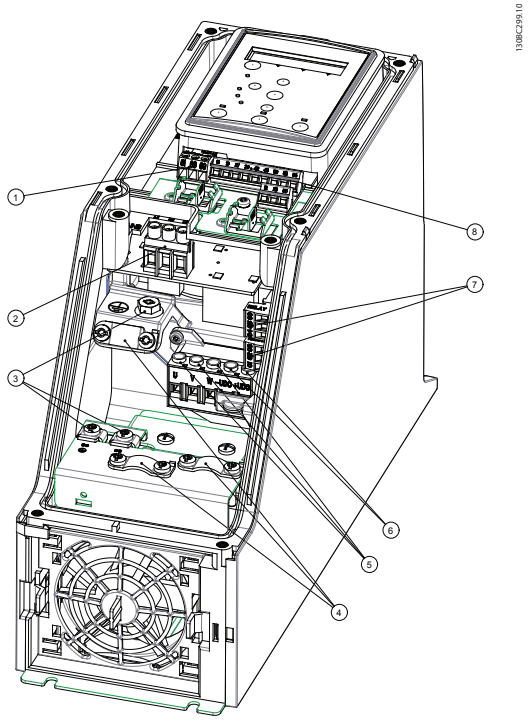
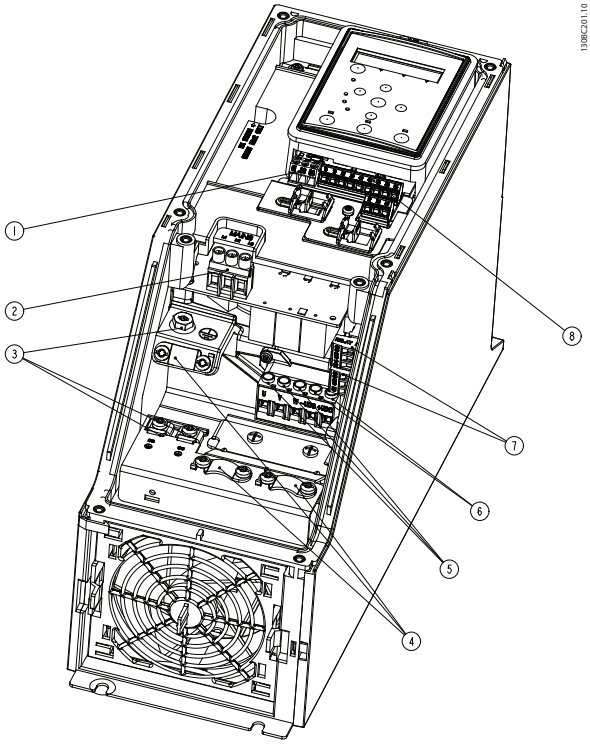
I2 Frame
IP54 380-480 V 0.75-4.0 kW



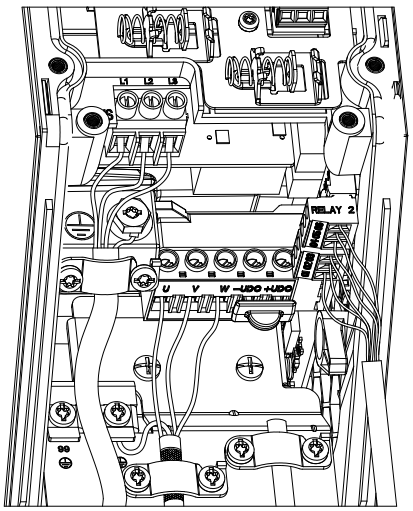
1	RS 485
2	Line in
3	Earth
4	Wire clamps
5	Motor
6	UDC
7	Relays
8	I/O

I3 Frame
IP54 380-480 V 5.5-7.5 kW



1	RS 485
2	Line in
3	Earth
4	Wire clamps
5	Motor
6	UDC
7	Relays
8	I/O

IP54 I2-I3 frame



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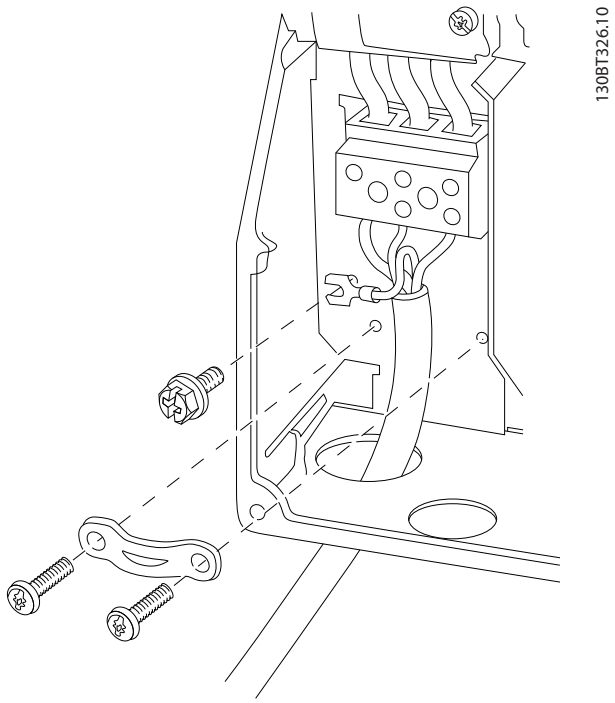
I6 Frame
IP54 380-480 V 22-37 kW



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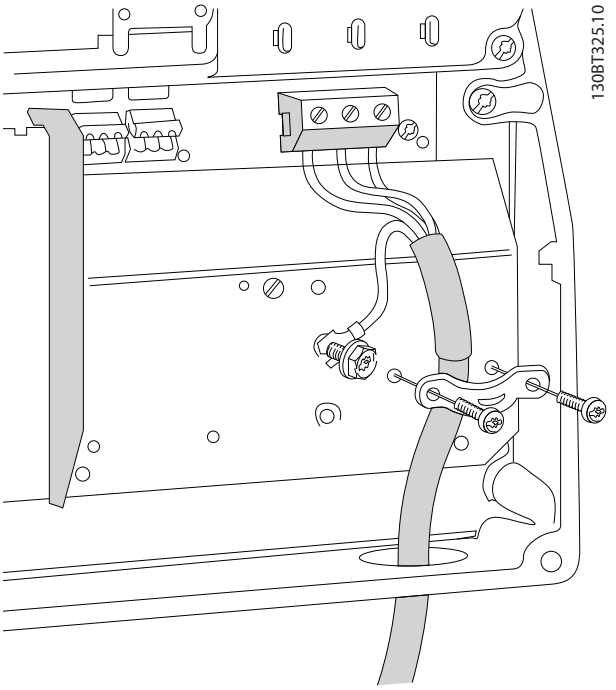

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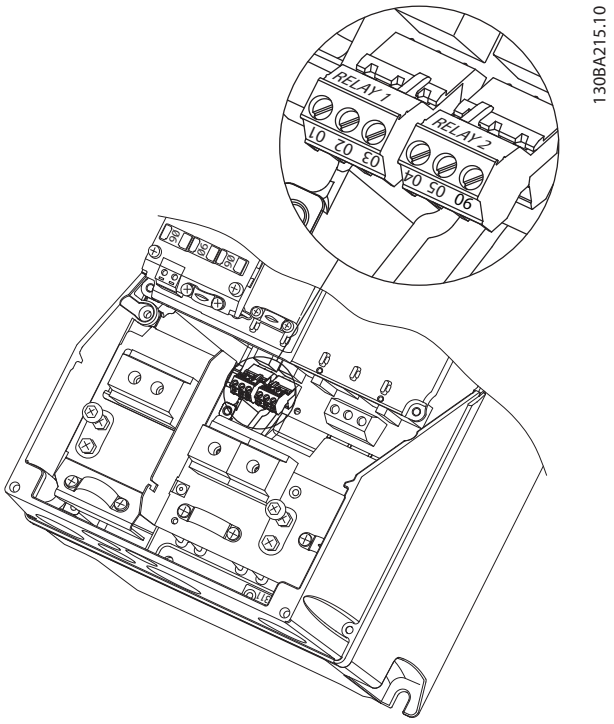
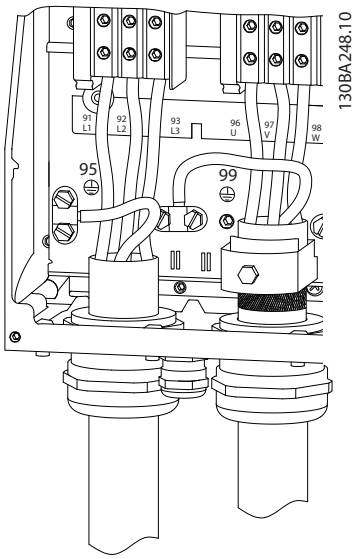


I7, I8 Frame
IP54 380-480 V 45-55 kW
IP54 380-480 V 75-90 kW



1.3.6 Fuses

Branch circuit protection
In order to protect the installation against electrical and fire hazard, all branch circuits in an installation, switch gear, machines etc., must be short-circuit and overcurrent protected according to national/international regulations.

Short circuit protection
Danfoss recommends using the fuses mentioned in the following tables to protect service personnel or other equipment in case of an internal failure in the unit or short-circuit on DC-link. The frequency converter provides full short circuit protection in case of a short-circuit on the motor.

Overcurrent protection
Provide overload protection to avoid overheating of the cables in the installation. Overcurrent protection must always be carried out according to national regulations. Fuses must be designed for protection in a circuit capable of supplying a maximum of 100,000 A_{rms} (symmetrical), 480 V maximum.

Non UL compliance
If UL/cUL is not to be complied with, Danfoss recommends using the fuses mentioned in *Table 1.3*, which will ensure compliance with IEC 61800-5-1:
In case of malfunction, not following the fuse recommendation may result in damage to the frequency converter.

	Circuit Breaker			Fuse				
	UL	Non UL		UL				Non UL
				Bussmann	Bussmann	Bussmann	Bussmann	Max fuse
Power kW				Type RK5	Type RK1	Type J	Type T	Type G
3 x 200 - 240 V IP20								
0.25				FRS-R-10	KTN-R10	JKS-10	JIN-10	10
0.37				FRS-R-10	KTN-R10	JKS-10	JIN-10	10
0.75				FRS-R-10	KTN-R10	JKS-10	JIN-10	10
1.5				FRS-R-10	KTN-R10	JKS-10	JIN-10	10
2.2				FRS-R-15	KTN-R15	JKS-15	JIN-15	16
3.7				FRS-R-25	KTN-R25	JKS-25	JIN-25	25
5.5				FRS-R-50	KTN-R50	JKS-50	JIN-50	50
7.5				FRS-R-50	KTN-R50	JKS-50	JIN-50	50
11				FRS-R-80	KTN-R80	JKS-80	JIN-80	65
15	Cutler-Hammer EGE3100FFG	Moeller NZMB1-A125		FRS-R-100	KTN-R100			125
18.5				FRS-R-100	KTN-R100			125
22	Cutler-Hammer JGE3150FFG	Moeller NZMB1-A160		FRS-R-150	KTN-R150			160
30				FRS-R-150	KTN-R150			160
37	Cutler-Hammer JGE3200FFG	Moeller NZMB1-A200		FRS-R-200	KTN-R200			200
45				FRS-R-200	KTN-R200			200
3 x 380 - 480 V IP20								
0.37				FRS-R-10	KTS-R10	JKS-10	JJS-10	10
0.75				FRS-R-10	KTS-R10	JKS-10	JJS-10	10
1.5				FRS-R-10	KTS-R10	JKS-10	JJS-10	10
2.2				FRS-R-15	KTS-R15	JKS-15	JJS-15	16
3				FRS-R-15	KTS-R15	JKS-15	JJS-15	16
4				FRS-R-15	KTS-R15	JKS-15	JJS-15	16
5.5				FRS-R-25	KTS-R25	JKS-25	JJS-25	25
7.5				FRS-R-25	KTS-R25	JKS-25	JJS-25	25
11				FRS-R-50	KTS-R50	JKS-50	JJS-50	50
15				FRS-R-50	KTS-R50	JKS-50	JJS-50	50
18.5				FRS-R-80	KTS-R80	JKS-80	JJS-80	65
22				FRS-R-80	KTS-R80	JKS-80	JJS-80	65
30	Cutler-Hammer EGE3125FFG	Moeller NZMB1-A125		FRS-R-80	KTS-R80	JKS-R80	JJS-R80	80
37				FRS-R-100	KTS-R100	JKS-R100	JJS-R100	100
45				FRS-R-125	KTS-R125	JKS-R125	JJS-R125	125
55	Cutler-Hammer JGE3200FFG	Moeller NZMB1-A200		FRS-R-150	KTS-R150	JKS-R150	JJS-R150	150
75				FRS-R-200	KTS-R200	JKS-R200	JJS-R200	200
90	Cutler-Hammer JGE3250FFG	Moeller NZMB2-A250		FRS-R-250	KTS-R250	JKS-R250	JJS-R250	250

1

	Circuit Breaker			Fuse				
	UL	Non UL		UL				Non UL
				Bussmann	Bussmann	Bussmann	Bussmann	Max fuse
Power kW				Type RK5	Type RK1	Type J	Type T	Type G
3 x 525 - 600 V IP20								
2.2					KTS-R20			20
3					KTS-R20			20
5.5					KTS-R20			20
7.5					KTS-R20			30
11					KTS-R30			35
15					KTS-R30			35
22	Cutler-Hammer	Cutler-Hammer		FRS-R-80	KTN-R80			80
30	EGE3080FFG	EGE3080FFG		FRS-R-80	KTN-R80			80
45	Cutler-Hammer	Cutler-Hammer		FRS-R-125	KTN-R125			125
55	JGE3125FFG	JGE3125FFG		FRS-R-125	KTN-R125			125
75	Cutler-Hammer	Cutler-Hammer		FRS-R-200	KTN-R200			200
90	JGE3200FAG	JGE3200FAG		FRS-R-200	KTN-R200			200
3 x 380 - 480 V IP54								
0.75								
1.5								
2.2								
3								
4								
5.5								
7.5								
11								
15								
18.5								
22	Moeller NZMB1-A125							125
30								125
37								125
45	Moeller NZMB2-A160							160
55								160
75	Moeller NZMB2-A250							200
90								200

Table 1.3 Fuses

1.3.7 EMC-Correct Electrical Installation

General points to be observed to ensure EMC-correct electrical installation.

- Use only screened/armoured motor cables and screened/armoured control cables.
- Connect the screen to earth at both ends.
- Avoid installation with twisted screen ends (pigtails), since this ruins the screening effect at high frequencies. Use the cable clamps provide-dinstead.
- It is important to ensure good electrical contact from the installation plate through the installation screws to the metal cabinet of the frequency converter.
- Use starwashers and galvanically conductive installation plates.
- Do not use unscreened/unarmoured motor cables in the installation cabinets.

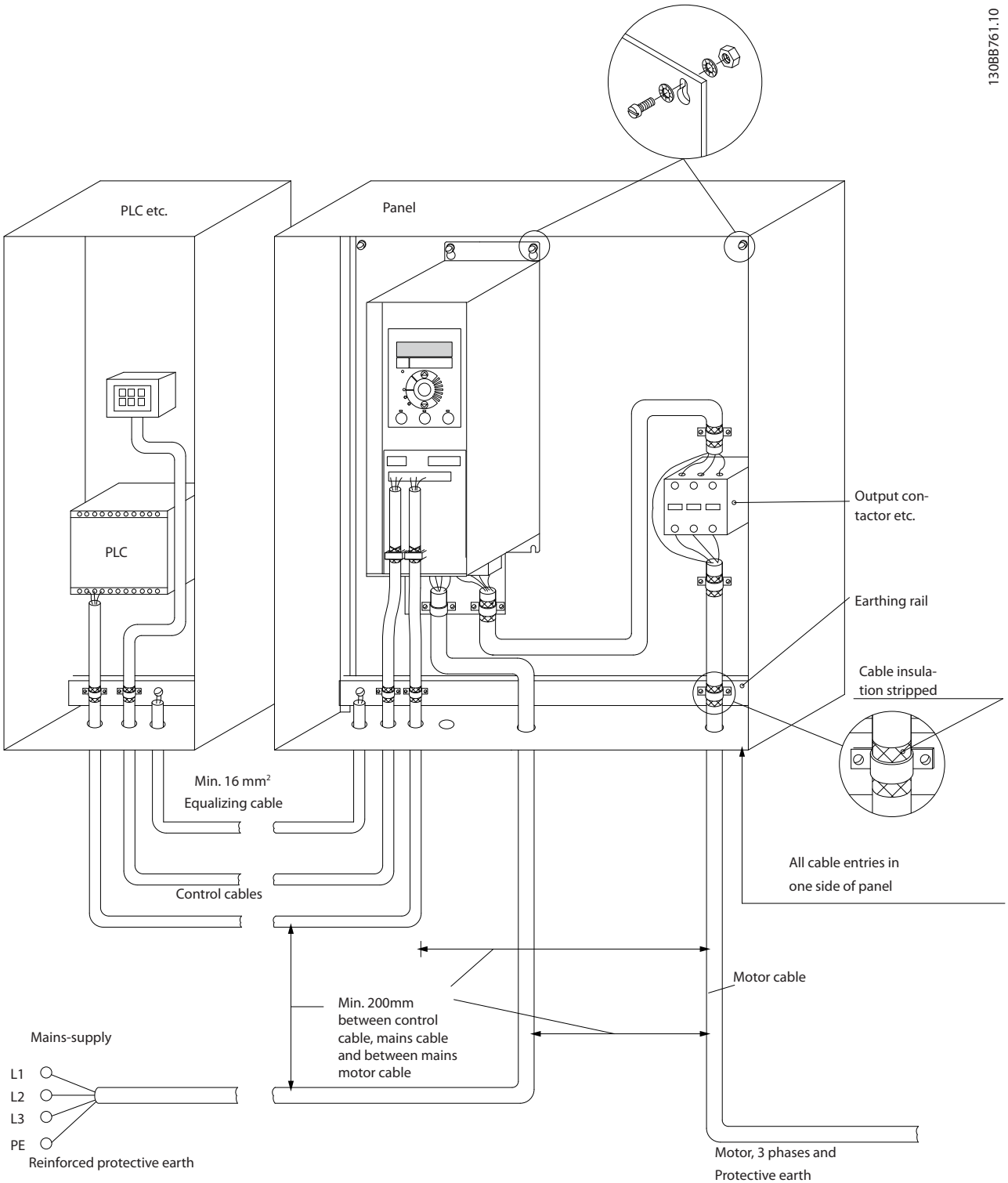


Illustration 1.3 EMC-correct Electrical Installation

For North America use metal conduits instead of shielded cables.

1

1.3.8 Control Terminals

IP20 200-240 V 0.25-11 kW and IP20 380-480 V 0.37-22 kW:

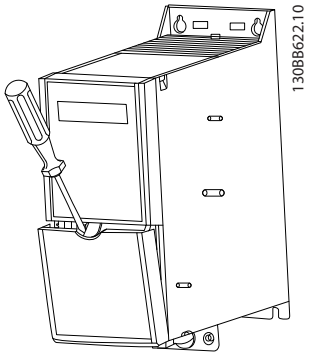
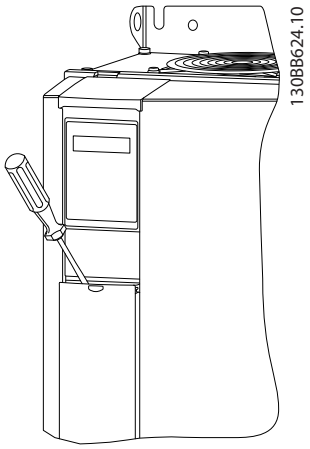


Illustration 1.4 Location of Control Terminals

1. Place a screwdriver behind the terminal cover to activate snap.
2. Tilt the screwdriver outwards to open the cover.

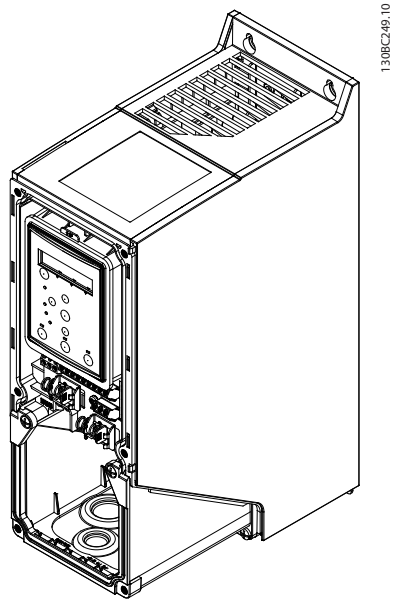
IP20 380-480V 30-90kW.



1. Place a screwdriver behind the terminal cover to activate snap.
2. Tilt the screwdriver outwards to open the cover.

Digital input 18, 19 and 27 mode is set in *5-00 Digital Input Mode* (PNP is default value) and digital input 29 mode is set in *5-03 Digital Input 29 Mode* (PNP is default value).

IP54 400 V 0.75-7.5 kW



1. Remove the front cover.

Control terminals:

Illustration 1.5 shows all control terminals of the frequency converter. Applying Start (term. 18), connection between terminal 12-27 and an analog reference (term. 53 or 54 and 55) make the frequency converter run.

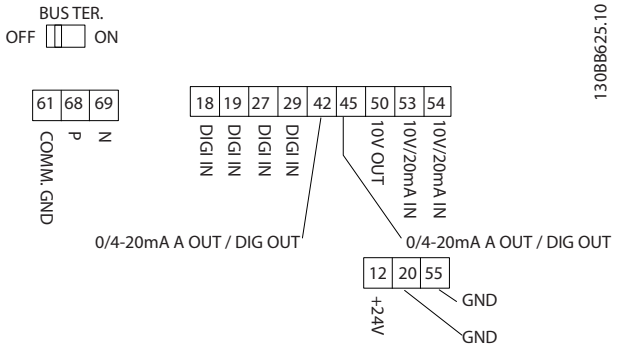
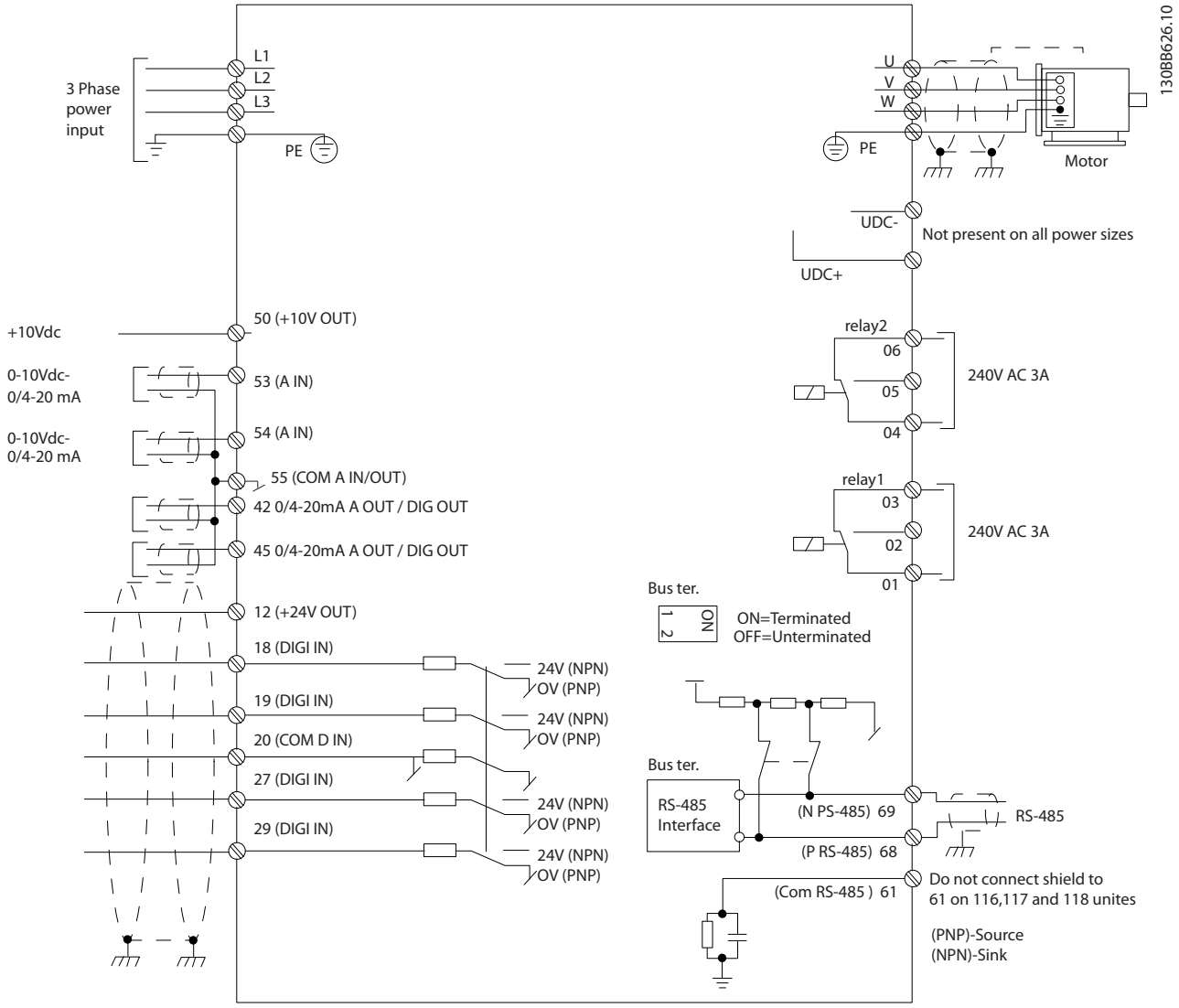


Illustration 1.5 Control Terminals

1.3.9 Electrical Overview



NOTE

Please note there is no access to UDC- and UDC+ on the following units:
IP20 380-480 V 30-90 kW
IP20 200-240 V 15-45 kW
IP20 525-600 V 2.2-90 kW
IP54 380-480 V 22-90 kW

1

1.4 Programming

1.4.1 Programming with the Local Control Panel (LCP)

NOTE

The frequency converter can also be programmed from a PC via RS485 com-port by installing the MCT-10 Set-up Software. This software can either be ordered using code number 130B1000 or downloaded from the Danfoss Web site: www.danfoss.com/BusinessAreas/DrivesSolutions/softwaredownload

1.4.2 Local Control Panel (LCP)

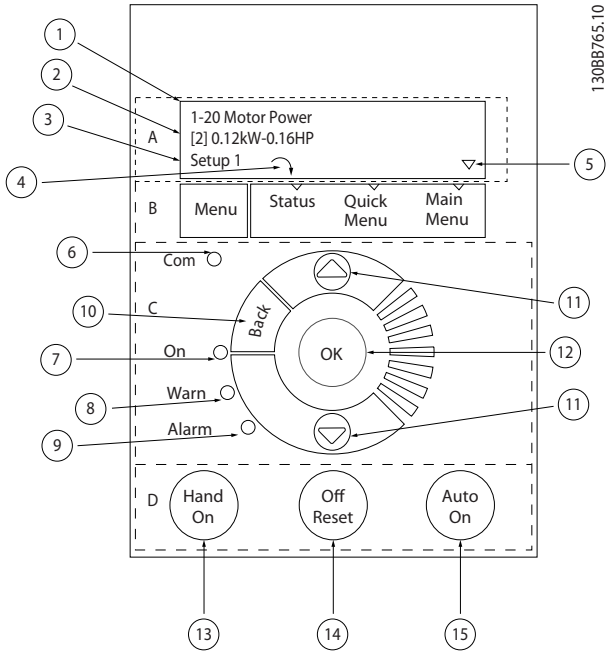
The following instructions are valid for the FC101 LCP. The LCP is divided into four functional sections.

A. Alphanumeric display

B. Menu key

C. Navigation keys and indicator lights (LEDs)

D. Operation keys and indicator lights (LEDs)



A. Alpha Numeric Display

The LCD-display is back-lit with 2 alpha-numeric lines. All data is displayed on the LCP.

A number of information can be read from the display.

1	Parameter number and name.
2	Parameter value.
3	Set-up number shows the active set-up and the edit set-up. If the same set-up acts as both active and edit set-up, only that set-up number is shown (factory setting). When active and edit set-up differ, both numbers are shown in the display (Setup 12). The number flashing, indicates the edit set-up.
4	Motor direction is shown to the bottom left of the display – indicated by a small arrow pointing either clockwise or counterclockwise.
5	The triangle indicates if the LCP is in status, quick menu or main menu.

B. Menu Key

Use the menu key to select between status, quick menu or main menu.

C. Navigation keys and indicator lights (LEDs)

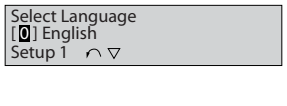
6	Com led: Flashes when bus communication is communicating.
7	Green LED/On: Control section is working.
8	Yellow LED/Warn.: Indicates a warning.
9	Flashing Red LED/Alarm: Indicates an alarm.
10	[Back]: For moving to the previous step or layer in the navigation structure
11	Arrows [▲] [▼]: For maneuvering between parameter groups, parameters and within parameters. Can also be used for setting local reference.
12	[OK]: For selecting a parameter and for accepting changes to parameter settings

D. Operation keys and indicator lights (LEDs)

13	[Hand On]: Starts the motor and enables control of the frequency converter via the LCP. **NOTE** **Please note that terminal 27 Digital Input (*5-12 Terminal 27 Digital Input*) has coast inverse as default setting. This means that [Hand On] will not start the motor if there is no 24 V to terminal 27, so please connect terminal 12 to terminal 27.**
14	[Off/Reset]: Stops the motor (off). If in alarm mode the alarm will be reset.
15	[Auto On]: frequency converter is controlled either via control terminals or serial communication.

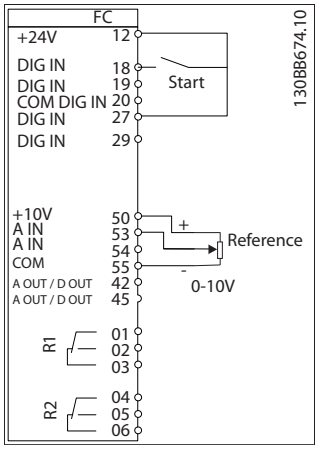
At power-up

At the first power-up the user is asked to choose preferred language. Once selected this screen will never be shown again in the following powerups, but language can still be changed in *0-01 Language*.

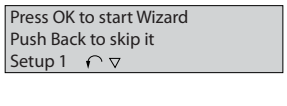


1.4.3 The Start-up Wizard for Open Loop Applications

The built in "wizard" menu guides the installer through the setup of the drive in a clear and structured manner in order to setup an open loop application. An open loop application is here an application with a start signal, analog reference (voltage or current) and optionally also relay signals (but no feed back signal from the process applied).



The wizard will initially be shown after power up until any parameter has been changed. The wizard can always be accessed again through the quick menu. Press [OK] to start the wizard. If [BACK] is pressed, the FC101 will return to the status screen.



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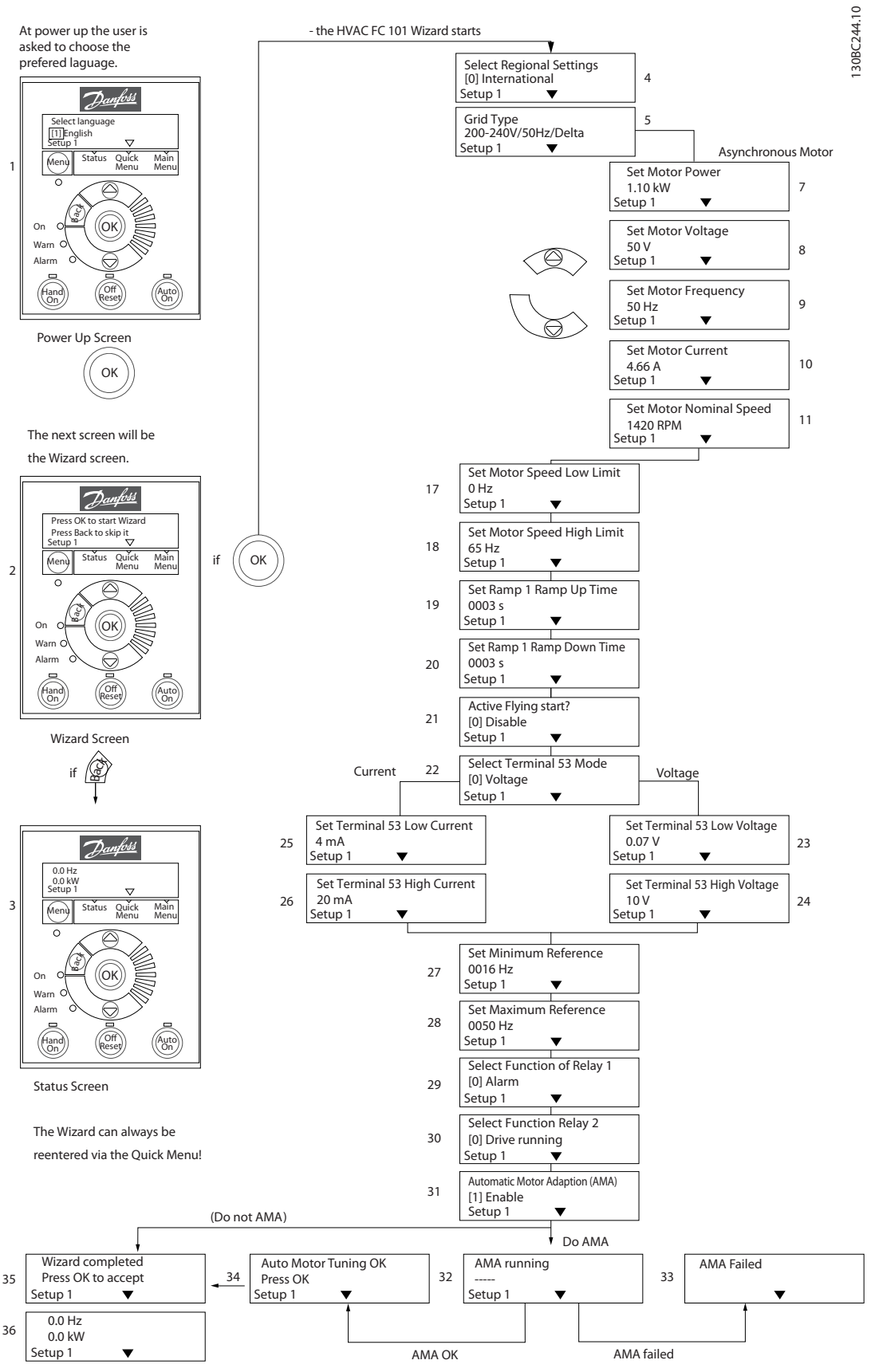

130BC244.10
At power up the user is asked to choose the prefered laguage.
Select language
[1] English
Setup 1
Menu
Status
Quick Menu
Main Menu
Back
OK
On
Warn
Alarm
Hand On
Off Reset
Auto On
1
Power Up Screen
OK
The next screen will be the Wizard screen.
Press OK to start Wizard
Press Back to skip it
Setup 1
2
Wizard Screen
if
Back
0.0 Hz
0.0 kW
Setup 1
3
Status Screen
The Wizard can always be reentered via the Quick Menu!
- the HVAC FC 101 Wizard starts
if
OK
Select Regional Settings
[0] International
Setup 1
4
Grid Type
200-240V/50Hz/Delta
Setup 1
5
Asynchronous Motor
Set Motor Power
1.10 kW
Setup 1
7
Set Motor Voltage
50 V
Setup 1
8
Set Motor Frequency
50 Hz
Setup 1
9
Set Motor Current
4.66 A
Setup 1
10
Set Motor Nominal Speed
1420 RPM
Setup 1
11
Set Motor Speed Low Limit
0 Hz
Setup 1
17
Set Motor Speed High Limit
65 Hz
Setup 1
18
Set Ramp 1 Ramp Up Time
0003 s
Setup 1
19
Set Ramp 1 Ramp Down Time
0003 s
Setup 1
20
Active Flying start?
[0] Disable
Setup 1
21
Select Terminal 53 Mode
[0] Voltage
Setup 1
22
Current
Voltage
Set Terminal 53 Low Current
4 mA
Setup 1
25
Set Terminal 53 High Current
20 mA
Setup 1
26
Set Terminal 53 Low Voltage
0.07 V
Setup 1
23
Set Terminal 53 High Voltage
10 V
Setup 1
24
Set Minimum Reference
0016 Hz
Setup 1
27
Set Maximum Reference
0050 Hz
Setup 1
28
Select Function of Relay 1
[0] Alarm
Setup 1
29
Select Function Relay 2
[0] Drive running
Setup 1
30
Automatic Motor Adaption (AMA)
[1] Enable
Setup 1
31
(Do not AMA)
Do AMA
Wizard completed
Press OK to accept
Setup 1
35
34
Auto Motor Tuning OK
Press OK
Setup 1
32
AMA running

Setup 1
33
AMA Failed
36
0.0 Hz
0.0 kW
Setup 1
AMA OK
AMA failed

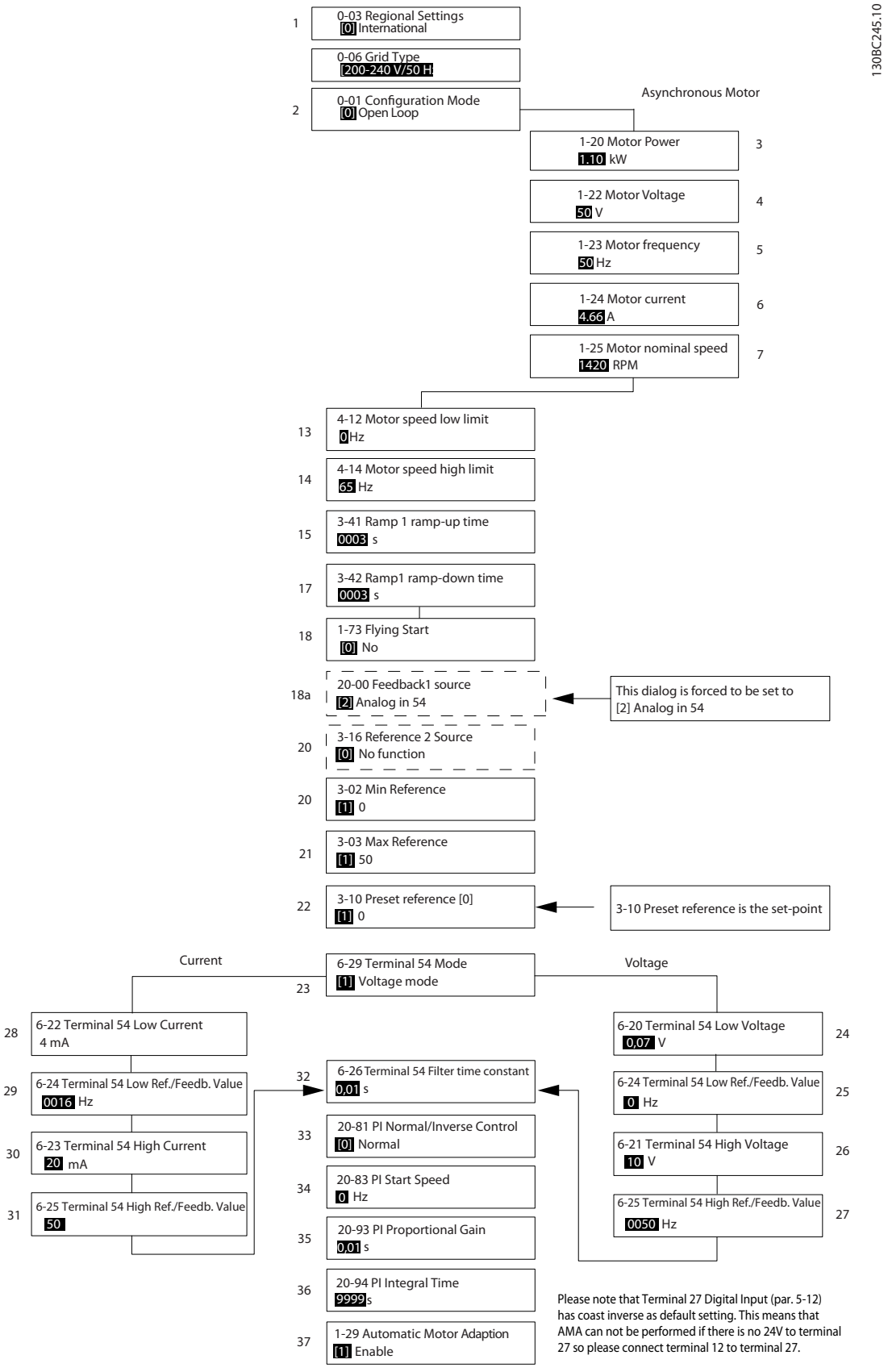
The FC101 Start-up Wizard for Open Loop Applications

No & Name	Range	Default	Function
0-03 Regional Settings	[0] International [1] US	0	
0-06 Grid Type	[0] 200-240 V/50 Hz/IT-grid [1] 200-240 V/50 Hz/Delta [2] 200-240 V/50 Hz [10] 380-440 V/50 Hz/IT-grid [11] 380-440 V/50 Hz/Delta [12] 380-440 V/50 Hz [20] 440-480 V/50 Hz/IT-grid [21] 440-480 V/50 Hz/Delta [22] 440-480 V/50 Hz [30] 525-600 V/50 Hz/IT-grid [31] 525-600 V/50 Hz/Delta [32] 525-600 V/50 Hz [100] 200-240 V/60 Hz/IT-grid [101] 200-240 V/60 Hz/Delta [102] 200-240 V/60 Hz [110] 380-440 V/60 Hz/IT-grid [111] 380-440 V/60 Hz/Delta [112] 380-440 V/60 Hz [120] 440-480 V/60 Hz/IT-grid [121] 440-480 V/60 Hz/Delta [122] 440-480 V/60 Hz [130] 525-600 V/60 Hz/IT-grid [131] 525-600 V/60 Hz/Delta [132] 525-600 V/60 Hz	Size related	Select operating mode for restart upon reconnection of the drive to mains voltage after power down
1-20 Motor Power	0.12-110 kW/0.16-150 hp	Size related	Enter motor power from nameplate data
1-22 Motor Voltage	50.0 - 1000.0 V	Size related	Enter motor voltage from nameplate data
1-23 Motor Frequency	20.0 - 400.0 Hz	Size related	Enter motor frequency from nameplate data
1-24 Motor Current	0.01 - 10000.00 A	Size related	Enter motor current from nameplate data
1-25 Motor Nominal Speed	100.0 - 9999.0 RPM	Size related	Enter motor nominal speed from nameplate data
4-12 Motor Speed Low Limit [Hz]	0.0 - 400 Hz	0 Hz	Enter the minimum limit for low speed
4-14 Motor Speed High Limit [Hz]	0.0 - 400 Hz	65 Hz	Enter the maximum limit for high speed
3-41 Ramp 1 Ramp up Time	0.05 - 3600.0 s	Size related	Ramp up time from 0 to rated *1-23 Motor Frequency*
3-42 Ramp 1 Ramp Down Time	0.05 - 3600.0 s	Size related	Ramp down time from rated *1-23 Motor Frequency* to 0
1-73 Flying Start	[0] Disabled [1] Enabled	0	Select Enable to enable the frequency converter to catch a spinning motor i.e. fan applications
6-19 Terminal 53 mode	[0] Current [1] Voltage	1	Select if terminal 53 is used for current- or voltage input
6-10 Terminal 53 Low Voltage	0-10 V	0.07 V	Enter the voltage that corresponds to the low reference value
6-11 Terminal 53 High Voltage	0-10 V	10 V	Enter the voltage that corresponds to the high reference value
6-12 Terminal 53 Low Current	0-20 mA	4	Enter the current that corresponds to the low reference value
6-13 Terminal 53 High Current	0-20 mA	20	Enter the current that corresponds to the high reference value
3-02 Minimum Reference	-4999-4999	0	The minimum reference is the lowest value obtainable by summing all references

1

No & Name	Range	Default	Function
3-03 Maximum Reference	-4999-4999	50	The maximum reference is the lowest obtainable by summing all references
5-40 Function Relay [0] Function relay	See *5-40 Function Relay*	Alarm	Select the function to control output relay 1
5-40 Function Relay [1] Function relay	See *5-40 Function Relay*	Drive running	Select the function to control output relay 2
1-29 Automatic Motor Adaption (AMA)	See *1-29 Automatic Motor Adaption (AMA)*	Off	Performing an AMA optimizes motor performance

Closed Loop Set-up Wizard



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Closed Loop Set-up Wizard

No & Name	Range	Default	Function
0-03 Regional Settings	[0] International [1] US	0	
0-06 Grid Type	[0]-[[132] please see start-up wizard for open loop application	Size selected	Select operating mode for restart upon reconnection of the frequency converter to mains voltage after power down
1-20 Motor power	0.09-110 kW	Size related	Enter motor power from nameplate data
1-22 Motor Voltage	50.0 - 1000.0 V	Size related	Enter motor voltage from nameplate data
1-23 Motor Frequency	20.0 - 400.0 Hz	Size related	Enter motor frequency from nameplate data
1-24 Motor Current	0.01 - 10000.00 A	Size related	Enter motor current from nameplate data
1-25 Motor Nominal Speed	100.0 - 9999.0 RPM	Size related	Enter motor nominal speed from nameplate data
4-12 Motor Speed Low Limit [Hz]	0.0 - 400 Hz	0.0 Hz	Enter the minimum limit for low speed
4-14 Motor Speed High Limit [Hz]	0.1 - 400 Hz	65Hz	Enter the maximum limit for high speed
3-41 Ramp 1 Ramp up Time	0.05 - 3600.0 s	Size related	Ramp up time from 0 to rated motor frequency parameter 1-23
3-42 Ramp 1 Ramp Down Time	0.05 - 3600.0 s	Size related	Ramp down time from rated motor frequency parameter 1-23 to 0
1-73 Flying Start	[0] Disabled [1] Enabled	0	Select Enable to enable the drive to catch a spinning motor
3-02 Minimum Reference	-4999-4999	0	The minimum reference is the lowest value obtainable by summing all references
3-03 Maximum Reference	-4999-4999	50	The maximum reference is the highest value obtainable by summing all references
3-10 Preset Reference	-100-100%	0	Enter the set point
6-29 Terminal 54 mode	[0] Current [1] Voltage	1	Select if terminal 54 is used for current- or voltage input
6-20 Terminal 54 Low Voltage	0-10 V	0.07V	Enter the voltage that corresponds to the low reference value
6-21 Terminal 54 High Voltage	0-10 V	10V	Enter the voltage that corresponds to the low high reference value
6-22 Terminal 54 Low Current	0-20 mA	4	Enter the current that corresponds to the high reference value
6-23 Terminal 54 High Current	0-20 mA	20	Enter the current that corresponds to the high reference value
6-24 Terminal 54 Low Ref./ Feedb. Value	-4999-4999	0	Enter the feedback value that corresponds to the voltage or current set in parameter 6-20/6-22
6-25 Terminal 54 High Ref./ Feedb. Value	-4999-4999	50	Enter the feedback value that corresponds to the voltage or current set in parameter 6-21/6-23
6-26 Terminal 54 Filter Time Constant	0-10 s	0.01	Enter the filter time comstant
20-81 PI Normal/Inverse control	[0] Normal [1] Inverse	0	Select *Normal* [0] to set the process control to increase the output speed when the process error is positive. Select *Inverse* [1] to reduce the output speed.
20-83 PI Start Speed	0-200 Hz	0	Enter the motor speed to be attained as a start signal for commencement of PI control
20-93 PI Proportional Gain	0-10	0.01	Enter the process controller proportional gain. Quick control is obtained at high amplification. However if amplification os too great, the process may become unstable
20-94 PI Integral Time	0.1-999.0 s	999.0 s	Enter the process controller integral time. Obtain quick control through a short integral time, though if the integral time is too short, the process becomes unstable. An excessively long integral time disables the integral action.
1-29 Automatic Motor Adaption (AMA)		Off	Performing an AMA optimizes motor performance

Motor Set-up

The Quick Menu Motor Set-up guides through the needed motor parameters.

No & Name	Range	Default	Function
0-03 Regional Settings	[0] International [1] US	0	
0-06 Grid Type	[0]-[132] please see start-up wizard for open loop application	Size selected	Select operating mode for restart upon reconnection of the frequency converter to mains voltage after power down
1-20 Motor power	0.12-110 kW/ 0.16-150 Hp	Size related	Enter motor power from nameplate data
1-22 Motor Voltage	50.0 - 1000.0 V	Size related	Enter motor voltage from nameplate data
1-23 Motor Frequency	20.0 - 400.0 Hz	Size related	Enter motor frequency from nameplate data
1-24 Motor Current	0.01 - 10000.00 A	Size related	Enter motor current from nameplate data
1-25 Motor Nominal Speed	100.0 - 9999.0 RPM	Size related	Enter motor nominal speed from nameplate data
4-12 Motor Speed Low Limit [Hz]	0.0 - 400 Hz	0.0 Hz	Enter the minimum limit for low speed
4-14 Motor Speed High Limit [Hz]	0-400 Hz	65	Enter the maximum limit for high speed
3-41 Ramp 1 Ramp up Time	0.05 - 3600.0 s	Size related	Ramp up time from 0 to rated motor frequency *1-23 Motor Frequency*
3-42 Ramp 1 Ramp Down Time	0.05 - 3600.0 s	Size related	Ramp down time from rated motor frequency *1-23 Motor Frequency* to 0
1-73 Flying Start	[0] Disabled [1] Enabled	0	Select Enable to enable the frequency converter to catch a spinning motor

Changes Made

Changes Made lists all parameters changed since factory setting. Only the changed parameters in current edit-setup are listed in changes made.

If the parameters value is changed back to factory setting's value from another different value, the parameter will NOT be listed in Changes Made.

1. Press [Menu] key to enter the Quick Menu until indicator in display is placed above Quick Menu.
2. Press [▲] [▼] to select either FC101 wizard, closed loop setup, motor setup or changes made, then press [OK].
3. Press [▲] [▼] to browse through the parameters in the Quick Menu.
4. Press [OK] to select a parameter.
5. Press [▲] [▼] to change the value of a parameter setting.
6. Press [OK] to accept the change.
7. Press either [Back] twice to enter “Status”, or press [Menu] once to enter “Main Menu”.

The Main Menu accesses all parameters.

1. Press [Menu] key until indicator in display is placed above “Main Menu”.
2. Use [▲] [▼] to browse through the parameter groups.
3. Press [OK] to select a parameter group.
4. Use [▲] [▼] to browse through the parameters in the specific group.
5. Press [OK] to select the parameter.
6. Use [▲] [▼] to set/change the parameter value.

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1.5 Parameter Overview

Parameter Overview			
*0-** Operation / Display*	[2] Set-up 2	**0-39 Display Text 3**	[15] 7.50 kW - 10.0 Hp
0-0 Basic Settings*	*[9] Active Set-up	*0-4* LCP Keypad*	[16] 11.00 kW - 15.00 Hp
0-01 Language	**0-12 Link Setups**	**0-40 [Hand on] Key on LCP**	[17] 15.00 kW - 20 Hp
*[0] English	[0] Not linked	[0] Disabled	[18] 18.5 kW - 25 Hp
[1] Deutsch	*[20] Linked	*[1] Enabled	[19] 22 kW - 30 Hp
[2] Francais	*0-3* LCP Readout*	**0-42 [Auto on] Key on LCP**	[20] 30 kW - 40 Hp
[3] Dansk	**0-30 Custom Readout Unit**	[0] Disabled	[21] 37 kW-50 Hp
[4] Espanol	[0] None	*[1] Enabled	[22] 45 kW-60 Hp
[5] Italiano	*[1] %	**0-44 [Off / Reset] Key on LCP**	[23] 55 kW-75 Hp
[28] Portuguese	[5] PPM	[0] Disable All	[24] 75 kW-100 Hp
[255] No Text	[10] 1/Min	*[1] Enable All	[25] 90 kW-120 Hp
0-03 Regional Settings	[11] RPM	[7] Enable Reset Only	[26] 110 kW-150 Hp
*[0] International	[12] Pulse/s	*0-5* Copy/Save*	**1-22 Motor Voltage**
[1] US	[20] l/s	**0-50 LCP Copy**	50 - 1000 V
0-04 Operating State at Power-up	[21] l/min	*[0] No copy	**1-23 Motor Frequency**
	[22] l/h	[1] All to LCP	20 - 400, *(50) Hz
*[0] Resume	[23] m3/s	[2] All from LCP	**1-24 Motor Current**
[1] Forced stop, ref=old	[24] m3/min	[3] Size indep. from LCP	0.01 - (26.00), [A]
0-06 GridType	[25] m3/h	**0-51 Set-up Copy**	**1-25 Motor Nominal Speed**
0] 200-240 V/50 Hz/IT-grid	[30] kg/s	*[0] No copy	100 rpm - 6000 rpm,
[1] 200-240 V/50 Hz/Delta	[31] kg/min	[1] Copy from setup 1	**1-29 Automatic Motor Adaption (AMA)**
[2] 200-240 V/50 Hz	[32] kg/h	[2] Copy from setup 2	
[10] 380-440 V/50 Hz/IT-grid	[33] t/min	[9] Copy from Factory setup	*[0] Off
[11] 380-440 V/50 Hz/Delta	[34] t/h	*0-6* Password*	[1] Enable Complete AMA
[12] 380-440 V/50 Hz	[40] m/s	**0-60 Main Menu Password**	[2] Enable Reduced AMA
[20] 440-480 V/50 Hz/IT-grid	[41] m/min	0 - 999, * 0	*1-3* Adv. Motor Data I*
[21] 440-480 V/50 Hz/Delta	[45] m	*1-** Load and Motor*	**1-30 Stator Resistance (Rs)**
[22] 440-480 V/50 Hz	[60] Degree Celsius	*1-0* General Settings*	0.000 ohm - 99.990 ohm
[30] 525-600 V/50 Hz/IT-grid	[70] mbar	**1-00 Configuration Mode**	**1-33 Stator Leakage Reactance (X1)**
[31] 525-600 V/50 Hz/Delta	[71] bar	*[0] Open loop	
[32] 525-600 V/50 Hz	[72] Pa	[3] Closed loop	0.000 ohm - 999.900 ohm
[100] 200-240 V/60 Hz/IT-grid	[73] kPa	**1-01 Motor Control Principle**	**1-35 Main Reactance (Xh)**
[101] 200-240 V/60 Hz/Delta	[74] m Wg	[0] U/f	0.00 - 999.90 ohm
[102] 200-240 V/60 Hz	[80] kW	*[1] VVC+	**1-39 Motor Poles**
[110] 380-440 V/60 Hz/IT-grid	[120] GPM	**1-03 Torque Characteristics**	2 - 100, * 4
[111] 380-440 V/60 Hz/Delta	[121] gal/s	*[1] Variable torque	*1-4* Adv. Motor Data II*
[112] 380-440 V/60 Hz	[122] gal/min	[3] Auto Energy Optim.	**1-42 Motor Cable Length**
[120] 440-480 V/60 Hz/IT-grid	[123] gal/h	**1-06 Clockwise Direction**	0 - 150, * 50m
[121] 440-480 V/60 Hz/Delta	[124] CFM	*[0] Normal	**1-43 Motor Cable Length Feet**
[122] 440-480 V/60 Hz	[127] ft3/h	[1] Inverse	0 - 431, * 144
[130] 525-600 V/60 Hz/IT-grid	[140] ft/s	**1-20 Motor Power**	*1-5* Load Indep. Setting*
[131] 525-600 V/60 Hz/Delta	[141] ft/min	[2] 0.12 kW - 0.16 Hp	**1-50 Motor Magnetisation at Zero Speed**
[132] 525-600 V/60 Hz	[160] Degree Fahr	[3] 0.18 kW - 0.25 Hp	
0-07 Auto DC Braking IT	[170] psi	[4] 0.25 kW - 0.33 Hp	0 - 300, * 100%
[0] Off	[171] lb/in2	[5] 0.37 kW - 0.50 Hp	**1-52 Min Speed Normal Magnetising [Hz]**
*[1] On	[172] in WG	[6] 0.55 kW - 0.75 Hp	
0-1 Set-up Operations*	[173] ft WG	[7] 0.75 kW - 1.00 Hp	0.0 - 10.0, * 0.0
0-10 Active Set-up	[180] HP	[8] 1.10 kW - 1.50 Hp	**1-55 U/f Characteristic - U**
*[1] Set-up 1	**0-31 Custom Readout Min Value**	[9] 1.50 kW - 2.00 Hp	0 - 999 V, *0V
[2] Set-up 2	0.00 - 1,000,000.0, * 0.00	[10] 2.20 kW - 3.00 Hp	**1-56 U/f Characteristic - F**
[9] Multi Set-up	**0-32 Custom Readout Max Value**	[11] 3.00 kW - 4.00 Hp	0 - 400 Hz, *(0)
0-11 Programming Set-up	0.00 - 1,000,000.0, * 100.00	[12] 3.70 kW - 5.00 Hp	*1-6* Load Depend. Setting*
[1] Set-up 1	**0-37 Display Text 1**	[13] 4.00 kW - 5.40 Hp	**1-62 Slip Compensation**
	0-38 Display Text 2	[14] 5.50 kW - 7.50 Hp	-400 - 399%, * 0%

Parameter Overview			
1-63 Slip Compensation Time Constant	***3-1* References***	0.00 - 194.00 A, * 0.00	[54] Auto start
0.05 - 5.00 s, * 0.10	**3-10 Preset Reference**	**4-51 Warning Current High**	[60] Counter A (up)
1-64 Resonance Dampening	-100.00 - 100.00 %, * 0.00	0.00 - 194.00 A, * 194.00	[61] Counter A (down)
0 - 500%, * 100	**3-11 Jog Speed [Hz]**	**4-54 Warning Reference Low**	[62] Reset Counter A
1-65 Resonance Dampening Time Constant	0.0 - 400.0 Hz, * 5.0	-4999.000 - 4999.000, *-4999.000	[63] Counter B (up)
	3-14 Preset Relative Reference	**4-55 Warning Reference High**	[64] Counter B (down)
0.001 - 0.050 s, * 0.005	-100.00 - 100.00, * 0.00	-4999.000 - 4999.000, *4999.000	[65] Reset Counter B
1-7* Start Adjustments	**3-15 Reference Resource 1**	**4-56 Warning Feedback Low**	**5-11 Terminal 19 Digital Input**
1-71 Start Delay	[0] No function	-4999.000 - 4999.000, *-4999.000	See par. 5-10, *[0] No operation
0.0 - 10.0 s, * 0.0	*[1] Analog in 53	**4-57 Warning Feedback High**	**5-12 Terminal 27 Digital Input**
1-72 Start Function	[2] Analog in 54	-4999.000 - 4999.000, *4999.000	See par. 5-10, *[2] Coast inverse
[0] DC Hold/delay time	[11] Local bus reference	**4-58 Missing Motor Phase Function**	**5-13 Terminal 29 Digital Input**
*[2] Coast/delay time	**3-16 Reference 2 Resource**	[0] Off	See par. 5-10, *[14 Jog]
1-73 Flying Start	[0] No function	*[1] On	***5-3* Digital Outputs***
*[0] Disabled	[1] Analog in 53	**4-6* Speed Bypass**	**5-34 On Delay, Digital Output**
[1] Enabled	*[2] Analog in 54	**4-61 Bypass Speed From [Hz]**	0.00 - 600.00 s, *0.01 s
1-8* Stop Adjustments	[11] Local bus reference	0.0 - 400.0, * 0.0	**5-35 Off Delay, Digital Output**
1-80 Function at Stop	**3-17 Reference 3 Resource**	**4-63 Bypass Speed To [Hz]**	0.00 - 600.00 s, *0.01 s
*[0] Coast	[0] No function	0.0 - 400.0, * 0.0	***5-4* Relays***
[1] DC hold/MotorPreheat	[1] Analog in 53	**4-64 Semi-Auto Bypass Set-up**	**5-40 Function Relay**
1-82 Min Speed for Function at Stop [Hz]	[2] Analog in 54	*[0] Off	*[0] No operation
	*[11] Local bus reference	[1] Enable	[1] Control ready
0.0 - 20.0 Hz, * 0.0	***3-4* Ramp 1***	***5-** Digital In/Out***	[2] Drive ready
1-9* Motor Temperature	**3-41 Ramp 1 Ramp up Time**	***5-0* Digital I/O mode***	[3] Drive ready/remote control
1-90 Motor Thermal Protection	0.05 - 3600.00 s, *Size related	**5-00 Digital Input Mode**	[4] Enable / no warning
*[0] No protection	**3-42 Ramp 1 Ramp Down Time**	*[0] PNP	[5] VLT running
[1] Thermistor warning	0.05 - 3600.00 s, *Size related	[1] NPN	[6] Running / no warning
[2] Thermistor trip	***3-5* Ramp 2***	**5-03 Digital Input 29 Mode**	[7] Run in range/no warning
[3] ETR warning 1	**3-51 Ramp 2 Ramp up Time**	*[0] PNP	[8] Run on ref/no warning
[4] ETR trip 1	0.05 - 3600.00 s, *Size related	[1] NPN	[9] Alarm
1-93 Thermistor Resource	**3-52 Ramp 2 Ramp down Time**	***5-1* Digital Inputs***	[10] Alarm or warning
*[0] None	0.05 - 3600.00 s, *Size related	**5-10 Terminal 18 Digital Input**	[12] Out of current range
[1] Analog input 53	***3-8* Other Ramps***	[0] No operation	[13] Below current, low
[6] Digital input 29	**3-80 Jog Ramp Time**	[1] Reset	[14] Above current, high
2-** Brakes	0.05 - 3600.00 s, *Size related	[2] Coast inverse	[16] Below frequency, low
2-0* DC-Brake	**3-81 Quick Stop Ramp Time**	[3] Coast and reset inverse	[17] Above frequency, high
2-00 DC Hold/Motor Preheat Current	0.05 - 3600.00 s, *Size related	[4] Quick stop inverse	[19] Below feedback, low
	4-** Limits / Warnings	[5] DC-brake inverse	[20] Above feedback, high
0 - 160%, * 50	***4-1* Motor Limits***	[6] Stop inverse	[21] Thermal warning
2-01 DC Brake Current	**4-10 Motor Speed Direction**	[7] External Interlock	[22] Ready, no thermal warning
0 - 150%, * 50	[0] Clockwise	*[8] Start	[23] Remote, ready, no thermal warning
2-02 DC Braking Time	*[2] Both directions	[9] Latched start	[24] Ready, Voltage OK
0.0 - 60.0 s, * 10.0	**4-12 Motor Speed Low Limit [Hz]**	[10] Reversing	[25] Reverse
2-04 DC Brake Cut In Speed	0.0 - 400 Hz, * 0.0 Hz	[11] Start reversing	[26] Bus OK
0.0 - 400.0 Hz, * 0.0	**4-14 Motor Speed High Limit [Hz]**	[14] Jog	[35] External Interlock
2-1* Brake Energy Funct.	0.1 - 400 Hz, * 65.0 Hz	[16] Preset ref bit 0	[36] Control word bit 11
2-17 Over-voltage Control	**4-18 Current Limit**	[17] Preset ref bit 1	[37] Control word bit 12
[0] Disabled	0 - 300%, * 110	[18] Preset ref bit 2	[45] Bus Control
*[2] Enabled	**4-19 Max Output Frequency**	[19] Freeze reference	[60] Comparator 0
3-** Reference / Ramps	0.0 - 400.0 Hz, * 65.0	[20] Freeze output	[61] Comparator 1
3-0* Reference Limits	***4-4* Adj. Warnings 2***	[21] Speed up	[62] Comparator 2
3-02 Minimum Reference	4-40 Warning Freq. Low	[22] Speed down	[63] Comparator 3
(-4999.000) - 4999.000, * 0.000	0.0-400.0 Hz, *400.0	[23] Set-up select bit 0	[64] Comparator 4
3-03 Maximum Reference	4-41 Warning Freq. High	[34] Ramp bit 0	[65] Comparator 5
(-4999.000) - 4999.000, * 50.000	0.0-400.0 Hz, *400.0	[37] Fire mode	[70] Logic rule 0
	4-5* Adj. Warnings	[52] Run permissive	71] Logic rule 1
	4-50 Warning Current Low	[53] Hand Start	[72] Logic rule 2

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Parameter Overview			
[73] Logic rule 3	[0] Current mode	[26] Bus OK	[4] Enable / no warning
[74] Logic rule 4	*[1] Voltage mode	[35] External Interlock	[5] Drive running
[75] Logic rule 5	***6-2* Analog Input 54***	[45] Bus Control	[6] Running / no warning
[80] SL digital output A	**6-20 Terminal 54 Low Voltage**	[60] Comparator 0	[7] Run in range/no warning
[81] SL digital output B	0.00 - 10.00V, * 0.07	[61] Comparator 1	[8] Run on ref/no warning
[82] SL digital output C	**6-21 Terminal 54 High Voltage**	[62] Comparator 2	[9] Alarm
[83] SL digital output D	0.00 - 10.00V, * 10.00	[63] Comparator 3	[10] Alarm or warning
[160] No alarm	**6-22 Terminal 54 Low Current**	[64] Comparator 4	[12] Out of current range
[161] Running reverse	0.00 - 20.00, * 4.00mA	[65] Comparator 5	[13] Below current, low
[165] Local ref. active	**6-23 Terminal 54 High Current**	[70] Logic rule 0	[14] Above current, high
[166] Remote ref. active	0.00 - 20.00, * 20.00mA	[71] Logic rule 1	[21] Thermal warning
[167] Start command activ	**6-24 Terminal 54 Low Ref./Feedb. Value**	[72] Logic rule 2	[22] Ready, no thermal warning
[168] Drive in hand mode	-4999.000 - 4999.000, * 0.000	[73] Logic rule 3	[23] Remote, ready, no thermal warning
[169] Drive in auto mode	**6-25 Terminal 54 High Ref./ Feedb. Value**	[74] Logic rule 4	[24] Ready, Voltage OK
[193] Sleep Mode	-4999.000 - 4999.000, * 50.000	[75] Logic rule 5	[25] Reverse
[194] Broken Belt Function	**6-26 Terminal 54 Filter Time Constant**	[80] SL digital output A	[26] Bus OK
[196] Fire Mode	0.01 - 10.00, * 0.01	[81] SL digital output B	[35] External Interlock
[198] Drive Bypass	**6-29 Terminal 54 mode [0] Current mode**	[82] SL digital output C	[45] Bus Control
5-41 On Delay, Relay	[0] Current mode	[83] SL digital output D	[60] Comparator 0
0.00 - 600.00 s, *0.01 s	*[1] Voltage mode	[160] No alarm	[61] Comparator 1
5-42 Off Delay, Relay	***6-7* Analog Output 45***	[161] Running reverse	[62] Comparator 2
0.00 - 600.00 s, *0.01 s	**6-70 Terminal 45 Mode**	[165] Local ref. active	[63] Comparator 3
5-5* Pulse Input	*[0] 0-20 mA	[166] Remote ref. active	[64] Comparator 4
5-9* Bus Controlled	[1] 4-20 mA	[167] Start command activ	[65] Comparator 5
5-90 Digital and Relay Bus Control	[2] Digital Output	[168] Drive in hand mode	[70] Logic rule 0
0 - 0xFFFFFFFF, * 0	**6-71 Terminal 45 Analog Output**	[169] Drive in auto mode	[71] Logic rule 1
6-** Analog In/Out	*[0] No operation	[193] Sleep Mode	[72] Logic rule 2
6-0* Analog I/O Mode	[100] Output frequency	[194] Broken Belt Function	[73] Logic rule 3
6-00 Live Zero Timeout Time	[101] Reference	[196] Fire Mode	[74] Logic rule 4
1 - 99s, * 10	[102] Feedback	[198] Bypass Mode	[75] Logic rule 5
6-01 Live Zero Timeout Function	[103] Motor current	**6-73 Terminal 45 Output Min Scale**	[80] SL digital output A
*[0] Off	[106] Power	0.00 - 200.00%, * 0.00	[81] SL digital output B
[1] Freeze output	[139] Bus Control	**6-74 Terminal 45 Output Max Scale**	[82] SL digital output C
[2] Stop	**6-72 Terminal 45 Digital Output**	0.00 - 200.00%, * 100.00	[83] SL digital output D
[3] Jogging	*[0] No operation	**6-76 Terminal 45 Output Bus Control**	[160] No alarm
[4] Max. speed	[1] Control ready	0.00 - 100.00%, * 0.00	[161] Running reverse
[5] Stop and trip	[2] Drive ready	***6-9* Analog Output 42***	[165] Local ref. active
6-1* Analog Input 53	[3] Drive ready/remote control	**6-90 Terminal 42 Mode**	[166] Remote ref. active
6-10 Terminal 53 Low Voltage	[4] Standby / no warning	*[0] 0-20 mA	[167] Start command activ
0.00 - 10.00 V, * 0.07	[5] Drive running	[1] 4-20 mA	[168] Drive in hand mode
6-11 Terminal 53 High Voltage	[6] Running / no warning	[2] Digital Output	[169] Drive in auto mode
0.00 - 10.00 V, * 10.00	[7] Run in range/no warning	**6-91 Terminal 42 Analog Output**	[193] Sleep Mode
6-12 Terminal 53 Low Current	[8] Run on ref/no warning	*[0] No operation	[194] Broken Belt Function
0.00 - 20.00, * 4.00 mA	[9] Alarm	[100] Output frequency	[196] Fire Mode
6-13 Terminal 53 High Current	[10] Alarm or warning	[101] Reference	[198] Drive Bypass
0.00 - 20.00, * 20.00 mA	[12] Out of current range	[102] Feedback	**6-93 Terminal 42 Output Min Scale**
6-14 Terminal 53 Low Ref./Feedb. Value	[13] Below current, low	[103] Motor current	0.00 - 200.00%, * 0.00
-4999.000 - 4999.000, * 0.000	[14] Above current, high	[105] TorquereltoRated	**6-94 Terminal 42 Output Max Scale**
6-15 Terminal 53 High Ref./ Feedb. Value	[21] Thermal warning	[106] Power	0.00 - 200.00%, * 100.00
-4999.000 - 4999.000, * 50.000	[22] Ready, no thermal warning	[139] Bus Control	**6-96 Terminal 42 Output Bus Control**
6-16 Terminal 53 Filter Time Constant	[23] Remote, ready, no thermal warning	**6-92 Terminal 42 Digital Output**	0.00 - 100.00%, * 0.00
0.01 - 10.00 s, * 0.01	[24] Ready, Voltage OK	*[0] No operation	***8-** Comm. and Options***
6-19 Terminal 53 mode	[25] Reverse	[1] Control ready	***8-0* Comm. General Settings***
		[2] Drive ready	**8-01 Control Site**
		[3] Drive ready/remote control	

Parameter Overview			
*[0] Digital and ctrl.word	*[3] Logic OR	***13-0* SLC Settings***	[12] Analog in 53
[1] Digital only	**8-52 DC Brake Select**	**13-00 SL Controller Mode**	[13] Analog in 54
[2] Controlword only	[0] Digital input	*[0] Off	[20] Alarm number
8-02 Control Source	[1] Bus	[1] On	[30] Counter A
[0] None	[2] Logic AND	**13-01 Start Event**	[31] Counter B
*[1] FC Port	*[3] Logic OR	[0] False	**13-11 Comparator Operator**
8-03 Control Timeout Time	**8-53 Start Select**	[1] True	[0] Less Than
0.1 - 6500.0s, * 1.0	[0] Digital input	[2] Running	*[1] Approx. Equal
8-04 Control Timeout Function	[1] Bus	[3] In range	[2] GreaterThan
*[0] Off	[2] Logic AND	[4] On reference	**13-12 Comparator Value**
[1] Freeze output	*[3] Logic OR	[7] Out of current range	-9999.0 - 9999.0, * 0.0
[2] Stop	**8-54 Reversing Select**	[8] Below I_{low}	***13-2* Timers***
[3] Jogging	[0] Digital input	[9] Above I_{high}	**13-20 SL Controller Timer**
[4] Max. speed	[1] Bus	[16] Thermal warning	0.00 - 3600.00, * 0.00
[5] Stop and trip	[2] Logic AND	[17] Mains out of range	***13-4* Logic Rules***
[20] N2 Override Release	*[3] Logic OR	[18] Reversing	**13-40 Logic Rule Boolean 1**
8-06 Reset Control Word Timeout	**8-55 Set-up Select**	[19] Warning	See par. 13-01, *[0] False
*[0] No function	[0] Digital input	[20] Alarm (trip)	**13-41 Logic Rule Operator 1**
[1] Do reset	[1] Bus	[21] Alarm (trip lock)	*[0] Disabled
8-3* FC Port Settings	[2] Logic AND	[22] Comparator 0	[1] AND
8-30 Protocol	*[3] Logic OR	[23] Comparator 1	[2] OR
*[0] FC	**8-56 Preset Reference Select**	[24] Comparator 2	[3] AND NOT
[2] Modbus RTU	[0] Digital input	[25] Comparator 3	[4] OR NOT
[3] Metasys N2	[1] Bus	[26] Logic rule 0	[5] NOT AND
[4] FLN	[2] Logic AND	[27] Logic rule 1	[6] NOT OR
[5] BACNet	*[3] Logic OR	[28] Logic rule 2	[7] NOT AND NOT
8-31 Address	***8-7* Bacnet***	[29] Logic rule 3	[8] NOT OR NOT
1 - 247 , * 1	**8-70 BACnet Device Instance**	[33] Digital input 18	**13-42 Logic Rule Boolean 2**
8-32 FC Port Baud Rate	0 - 0x400000UL	[34] Digital input 19	See par. 13-01, *[0] False
[0] 2400 Baud	* 1	[35] Digital input 27	**13-43 Logic Rule Operator 2**
[1] 4800 Baud	**8-72 MS/TP Maxmaster**	[36] Digital input 29	See par. 13-41, *[0] Disabled
*[2] 9600 Baud	0 - 127, * 127	*[39] Start command	**13-44 Logic Rule Boolean 3**
[3] 19200 Baud	**8-73 MS/TP Max Info Frames**	[40] Drive stopped	See par. 13-01, *[0] False
[4] 38400 Baud	1 - 65534, * 1	[41] Reset trip	***13-5* States***
[5] 57600 Baud	**8-74 "I am" Service**	[42] Auto reset trip	**13-51 SL Controller Event**
[6] 76800 Baud	*[0] Send at power-up	[43] Key Ok	See par. 13-01, *[0] False
[7] 115200 Baud	[1] Continuously	[44] Key Reset	**13-52 SL Controller Action**
8-33 FC Port Parity	**8-75 Intialisation Password**	[47] Key Up	*[0] Disabled
*[0] Even Parity, 1 Stop Bit	***8-8* FC Port Diagnostics***	[48] Key Down	[1] No action
[1] Odd Parity, 1 Stop Bit	**8-80 Bus Message Count**	[50] Comparator 4	[2] Select set-up 1
[2] No Parity, 1 Stop Bit	0 - 65536, * 0	[51] Comparator 5	[3] Select set-up 2
[3] No Parity, 2 Stop Bits	**8-81 Bus Error Count**	[60] Logic rule 4	[10] Select preset ref 0
8-35 Minimum Response Delay	0 - 65536, * 0	[83] Broken belt	[11] Select preset ref 1
0.001 - 0.500s, * 0.010	**8-82 Slave Message Rcvd**	**13-02 Stop Event**	[12] Select preset ref 2
8-36 Max Response Delay	0 - 65536, * 0	See par. 13-02, *[40] Drive stopped	[13] Select preset ref 3
0.100 - 10.000s, *5.000	**8-83 Slave Error Count**	**13-03 Reset SLC**	[14] Select preset ref 4
8-37 Max Inter-char delay	0 - 65536, * 0	*[0] Do not reset	[15] Select preset ref 5
0.025 - 0.025s, * 0.025	**8-84 Slave Message Sent**	[1] Reset SLC	[16] Select preset ref 6
8-5* Digital/Bus	0 - 65536, * 0	***13-1* Comparators***	[17] Select preset ref 7
8-50 Coasting Select	**8-85 Slave Timeout Errors**	**13-10 Comparator Operand**	[18] Select ramp 1
[0] Digital input	0 - 65536, * 0	*[0] Disabled	[19] Select ramp 2
[1] Bus	**8-88 Reset FC port Diagnostics**	[1] Reference	[22] Run
[2] Logic AND	*[0] Do not reset	[2] Feedback	[23] Run reverse
*[3] Logic OR	[1] Reset counter	[3] Motor speed	[24] Stop
8-51 Quick Stop Select	***8-9* Bus Feedback***	[4] Motor current	[25] Qstop
[0] Digital input	***8-94 Bus feedback 1***	[6] Motor power	[26] DC Brake
[1] Bus	-32768 - 32767, * 0	[7] Motor voltage	[27] Coast
[2] Logic AND	***13-** Smart Logic***	[8] DC-link voltage	[28] Freeze output

1

Parameter Overview			
[29] Start timer 0	[11] Automatic reset x 15	**15-05 Over Volt's**	**16-38 SL Controller State**
[30] Start timer 1	[12] Automatic reset x 20	0 - 65535, * 0	0 - 255, * 0
[31] Start timer 2	[13] Infinite auto reset	**15-06 Reset kWh Counter**	***16-5* Ref. and Feedb.***
[32] Set digital out A low	**14-21 Automatic Restart Time**	*[0] Do not reset	**16-50 External Reference**
[33] Set digital out B low	0 - 600s, * 10	[1] Reset counter	-200.0 - 200.0%, * 0.0
[34] Set digital out C low	**14-22 Operation Mode**	**15-07 Reset Running Hours**	**16-52 Feedback**
[35] Set digital out D low	*[0] Normal operation	**Counter**	-4999.000 - 4999.000, * 0.000
[38] Set digital out A high	[2] Initialisation	*[0] Do not reset	**16-6* Inputs and Outputs**
[39] Set digital out B high	**14-27 Action At Inverter Fault**	[1] Reset counter	**16-60 Digital input**
[40] Set digital out C high	[0] Off	***15-3* Fault Log***	0 - 65535, * 0
[41] Set digital out D high	*[1] On	***15-30 Fault Log:***	**16-61 Terminal 53 Setting**
[60] Reset Counter A	**14-28 Production Settings**	Error Code 0 - 255, * 0	*[0] Current mode
[61] Reset Counter B	*[0] No action	***15-4* Drive Identification***	[1] Voltage mode
[70] Start timer 3	[1] Service reset	**15-40 FC Type**	**16-62 Analog Input 53**
[71] Start timer 4	[3] Software Reset	**15-41 Power Section**	0.00 - 10.00, * 1.00
[72] Start timer 5	**14-29 Service Code**	**15-42 Voltage**	**16-63 Terminal 54 Setting**
[73] Start timer 6	0 - 0x7FFFFFFF, * 0	**15-43 Software Version**	*[0] Current mode
[74] Start timer 7	***14-3* Current Limit Ctrl.***	**15-44 OrderedTypeCode**	[1] Voltage mode
[100] Reset Alarm	***14-4* Energy Optimising***	**15-46 Frequency Converter**	**16-64 Analog Input 54**
14-** Special Functions	**14-40 VT Level**	Ordering No	0.00 - 20.00, * 1.00
14-0* Inverter Switching	40 - 90%, * 90%	**15-47 Power Card Ordering No**	**16-65 Analog Output 42 [mA]**
14-01 Switching Frequency	**14-41 AEO Minimum Magnetisation**	**15-48 LCP Id No**	0.00 - 20.00, * 0.00
[0] Ran3	40 - 75%, * 66	**15-49 Software ID Control Card**	**16-61 Digital Output**
[1] Ran5	***14-5* Environment***	**15-50 Software ID Power Card**	**16-72 Counter A**
[2] 2.0 kHz	**14-50 RFI Filter**	**15-51 Frequency Converter Serial**	-32768 - 32767, * 0
[3] 3.0 kHz	[0] Off	**Number**	**16-73 Counter B**
[4] 4.0 kHz	*[1] On	**15-53 Power Card Serial Number**	-32768 - 32767, * 0
[5] 5.0 kHz	**14-51 DC-link Voltage Compen-**	***16-** Data Readouts***	**16-79 Analog output 45**
[6] 6.0 kHz	**sation**	***16-0* General Status***	20 - 20mA, * 0
[7] 8.0 kHz	[0] Off	**16-00 Control Word**	***16-8* Fieldbus / FC Port***
[8] 10.0 kHz	*[1] On	0 - 65535, * 0	**16-86 FC Port REF 1**
[9] 12.0kHz	**14-52 Fan Control**	**16-01 Reference [Unit]**	-32768 - 32767, * 0
[10] 16.0kHz	*[0] Auto	-4999.000 - 4999.000, * 0.000	***16-9* Diagnosis Readouts***
14-03 Overmodulation	[4] Auto Low temp env	**16-02 Reference**	**16-90 Alarm Word**
[0] Off	**14-53 Fan Monitor**	% -200.0 - 200.0, * 0.0	0 - 0xFFFFFFFFUL, * 0
*[1] On	[0] Disabled	**16-03 Status Word**	**16-91 Alarm Word 2**
14-08 Damping Gain Factor	*[1] Warning	0 - 65535, * 0	0 - 0xFFFFFFFFUL, * 0
0 - 100-%, * 96	[2] Trip	**16-05 Main Actual Value [%]**	**16-92 Warning Word**
14-1* Mains on/off	**14-55 Output Filter**	-200.00 - 200.00, * 0.00	0 - 0x7FFFFFFFUL, * 0
14-12 Function at Mains	*[0] No Filter	**16-09 Custom Readout**	**16-93 Warning Word 2**
Imbalance	[1] Sine-Wave Filter	0.00 - 9999.00, * 0.00	0 - 0x7FFFFFFFUL, * 0
*[0] Trip	[3] Sine-Wave Filter with Feedback	***16-1* Motor Status***	**16-94 Ext. Status Word**
[1] Warning	**14-63 Min Switch Frequency**	***16-10 Power [kW]***	0 - 0x7FFFFFFFUL, * 0
[2] Disabled	1 - 16kHz, * 1	0.000-4.294, 967.500, *0.000	**16-95 Ext. Status Word 2**
[3] Derate	***15-** Drive Information***	***16-11 Power [hp]***	0 - 0x7FFFFFFFUL, * 0
14-2* Reset Functions	***15-0* Operating Data***	0.000 - 2.294, 967.500 *0.000	**18-**Extended Motor Data**
14-20 Reset Mode	**15-00 Operating Hours**	***16-3* Drive Status***	**18-1* Firemode Log**
*[0] Manual reset	0 - 2147483647, * 0	**16-30 DC Link Voltage**	**18-10 Firemode log: Event**
[1] Automatic reset x 1	**15-01 Running Hours**	0 - 65535, * 0	0-255, *0
[2] Automatic reset x 2	0 - 2147483647, * 0	**16-34 Heatsink Temp.**	***20-** FC Closed Loop***
[3] Automatic reset x 3	**15-02 kWh Counter**	0 - 255, * 0	***20-0* Feedback***
[4] Automatic reset x 4	0 - 65535, * 0	**16-35 Inverter Thermal**	**20-00 Feedback 1 Source**
[5] Automatic reset x 5	**15-03 Power Up's**	0 - 255%, * 0	*[0] No function
[6] Automatic reset x 6	0 - 2147483647, * 0	**16-36 Inv. Nom. Current**	[1] Analog in 53
[7] Automatic reset x 7	**15-04 Over Temp's**	0.00 - 655.35, * 0.00	[2] Analog in 54
[8] Automatic reset x 8	0 - 65535, * 0	**16-37 Inv. Max. Current**	[100] Bus Feedback 1
[9] Automatic reset x 9		0.00 - 655.35	
[10] Automatic reset x 10			

Parameter Overview			
20-01 Feedback 1 Conversion	**20-94 PI Integral Time**	**22-46 Maximum Boost Time**	*[0] Disabled
*[0] Linear	0.10 - 9999.00s, * 9999.00	0 - 600 s, * 60	[1] Enabled Run Forward
[1] Square root	**20-97 Process PI Feed Forward Factor**	**22-47 Sleep Speed [Hz]**	[2] Enabled Run Reverse
20-8* PI Basic Setting	0 - 400%, * 0	0.0 - 400.0, * 0.0	[3] Enable-Coast
20-81 Process PI Normal/ Inverse	***22-** Appl. functions***	***22-6* Broken Belt Detection***	[4] Enabled - Run Fwd/Rev
Control	***22-4* Sleep mode***	**22-60 Broken Belt Detection**	**24-05 Fire Mode Preset Reference**
*[0] Normal	**22-40 Minimum Run Time**	*[0] Off	-100 - 100%, * 0
[1] Inverse	0 - 600 s, * 10	[1] Warning	**24-09 Fire Mode Alarm Handling**
20-83 Process PI Start Speed[Hz]	**22-41 Minimum Sleep Time**	[2] Trip	*[1] Trip, Critical Alarms
0.0 - 200.0, * 0.0	0 - 600 s, * 10	**22-61 Broken Belt Torque**	[2] Trip, All Alarms/Test
20-84 On Reference Bandwidth	**22-43 Wake-Up Speed [Hz]**	5 - 100%, * 10	***24-1* Drive Bypass***
0 - 200%, * 5	0.0 - 400.0, * 100.0	**22-62 Broken Belt Delay**	**24-10 Drive Bypass Function**
20-9* PI Controller	**22-44 Wake-Up Ref./FB difference**	0 - 600 s, * 10	*[0] Disabled
20-91 PI Anti Windup	0 - 100%, * 10	***24-** Appl. functions 2***	[2] Enabled (Fire Mode only)
[0] Off	**22-45 Setpoint Boost**	***24-0* Fire mode***	**24-11 Bypass Delay Timer**
*[1] On	-100 - 100%, * 0	**24-00 Fire Mode Function**	0 - 600 s, * 0
20-93 PI Proportional Gain			
0.00 - 10.00, * 0.01			

1.6 Warnings and Alarms

Fault number	Alarm/ Warning Bit Number	Fault text	Warning	Alarm	Trip locked	Cause of problem
2	16	Live zero error	X	X		Signal on terminal 53 or 54 is less than 50% of value set in par. 6-10, 6-12, 6-20 or 6-22. See also parameter group 6-0X
4	14	Mains ph. loss	X	X	X	Missing phase on supply side or too high voltage imbalance. Check supply voltage. See parameter 14-12
7	11	DC over volt	X	X		Intermediate circuit voltage exceeds limit.
8	10	DC under volt	X	X		Intermediate circuit voltage drops below “voltage warning low” limit.
9	9	Inverter overload	X	X		More than 100% load for too long.
10	8	Motor ETR over	X	X		Motor is too hot due to more than 100% load for too long. See parameter 1-90
11	7	Motor th over	X	X		Thermistor or thermistor connection is disconnected. See parameter 1-90.
13	5	Over Current	X	X	X	Inverter peak current limit is exceeded.
14	2	Earth Fault		X	X	Discharge from output phases to ground.
16	12	Short Circuit		X	X	Short-circuit in motor or on motor terminals.
17	4	Ctrl.word TO	X	X		No communication to frequency converter. See parameter group 8-0X
24	50	Fan Fault	X	X		The fan is not working (Only on 400 V 30-90 kW units).
30	19	U phase loss		X	X	Motor phase U is missing. Check the phase. See parameter 4-58.
31	20	V phase loss		X	X	Motor phase V is missing. Check the phase. See parameter 4-58.
32	21	W phase loss		X	X	Motor phase W is missing. Check the phase. See parameter 4-58.
38	17	Internal fault		X	X	Contact your local Danfoss supplier.
44	28	Earth Fault		X	X	Discharge from output phases to ground.
47	23	Control Voltage Fault	X	X	X	24 V DC may be overloaded.
48	25	VDD1 Supply Low		X	X	Control voltage low. Please contact your local Danfoss supplier

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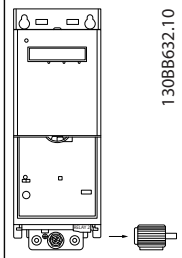
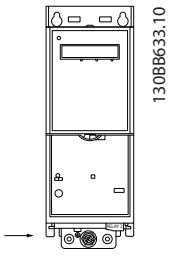
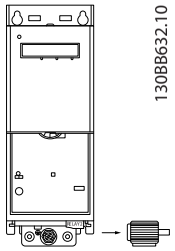
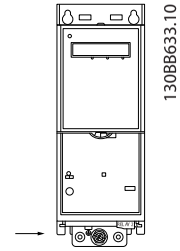
Fault number	Alarm/ Warning Bit Number	Fault text	Warning	Alarm	Trip locked	Cause of problem
50		AMA Calibration failed		X		Contact your local Danfoss supplier.
51	15	AMA Unom,Inom		X		The setting of motor voltage, motor current and motor power is presumably wrong. Check the settings.
52		AMA low Inom		X		The motor current is too low. Check the settings.
53		AMA big motor		X		The motor is too big for the AMA to be carried out
54		AMA small mot		X		The motor is too small for the AMA to be carried out
55		AMA par. range		X		The parameter values found from the motor are outside acceptable range
56		AMA user interrupt		X		The AMA has been interrupted by the user
57		AMA timeout		X		Try to start the AMA again a number of times, until the AMA is carried out. Please note that repeated runs may heat the motor to a level where the resistance Rs and Rr are increased. In most cases, however, this is not critical
58		AMA internal	X	X		Contact your local Danfoss supplier.
59	25	Current limit	X			The current is higher than the value in par. 4-18 Current Limit
60	44	External Interlock		X		External interlock has been activated. To resume normal operation, apply 24 V DC to the terminal programmed for external interlock and reset the frequency converter (via serial communication, digital I/O, or by pressing reset button on keypad).
66	26	Heat sink Temperature Low	X			This warning is based on the temperature sensor in the IGBT module (Only on 400 V 30-90 kW units).
69	1	Pwr. Card Temp	X	X	X	The temperature sensor on the power card is either too hot or too cold.
79		Illegal power section config-uration	X	X		Internal fault. Contact your local Danfoss supplier.
80	29	Drive initialised		X		All parameter settings are initialized to default settings.
87	47	Auto DC Braking	X			The drive is auto DC braking
95	40	Broken Belt	X	X		Torque is below the torque level set for no load, indicating a broken belt. See parameter group 22-6.
200		Fire Mode	X			Fire mode has been activated
202		Fire Mode Limits Exceeded	X			Fire Mode has suppressed one or more warranty voiding alarms
250		New sparepart		X	X	The power or switch mode power supply has been exchanged. (Only on 400 V 30-90 kW units). Contact your local Danfoss supplier
251		New Typecode		X	X	The frequency converter has a new type code (Only on 400 V 30-90 kW units). Contact your local Danfoss supplier.

1.7 General Specifications

1.7.1 Mains Supply 3 x 200-240 V AC

frequency converter		PK25	PK37	PK75	P1K5	P2K2	P3K7	P5K5	P7K5	P11K	P15K	P18K	P22K	P30K	P37K	P45K
Typical shaft output (kW)		0.25	0.37	0.75	1.5	2.2	3.7	5.5	7.5	11.0	15.0	18.5	22.0	30.0	37.0	45.0
Typical shaft output (hp)		0.33	0.5	1.0	2.0	3.0	5.0	7.5	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0
IP20 frame		H1	H1	H1	H1	H2	H3	H4	H4	H5	H6	H6	H7	H7	H8	H8
Max. cable size in terminals (mains, motor) [mm²/AWG]		4/10	4/10	4/10	4/10	4/10	4/10	16/6	16/6	16/6	35/2	35/2	50/1	50/1	95/0	120/ (4/0)
Output current																
 130BB632.10	**40°C ambient temperature**															
	Continuous (3 x 200-240 V) [A]	1.5	2.2	4.2	6.8	9.6	15.2	22.0	28.0	42.0	59.4	74.8	88.0	115.0	143.0	170.0
	Intermittent (3 x 200-240 V) [A]	1.7	2.4	4.6	7.5	10.6	16.7	24.2	30.8	46.2	65.3	82.3	96.8	126.5	157.3	187.0
Max. input current																
 130BB633.10																
	Continuous (3 x 200-240 V) [A]	1.1	1.6	2.8	5.6	8.6/7.2	14.1 / 12.0	21.0/ 18.0	28.3/ 24.0	41.0/ 38.2	52.7	65.0	76.0	103.7	127.9	153.0
	Intermittent (3 x 200-240 V) [A]	1.2	1.8	3.1	6.2	9.5/7.9	15.5 / 13.2	23.1/ 19.8	31.1/ 26.4	45.1/ 42.0	58.0	71.5	83.7	114.1	140.7	168.3
	Max. mains fuses	See *1.3.6 Fuses*														
	Estimated power loss [W], Best case/typical[1)]	12/14	15/18	21/26	48/60	80/102	97/120	182/ 204	229/ 268	369/ 386	512	658	804	1015	1459	1350
	Weight enclosure IP20 [kg]	2.	2.0	2.0	2.1	3.4	4.5	7.9	7.9	9.5	24.5	24.5	36.0	36.0	51.0	51.0
	Efficiency [%], Best case/Typical 1	97.0 / 96.5	97.3 / 96.8	98.0/ 97.6	97.6 / 97.0	97.1/ 96.3	97.9 / 97.4	97.3/ 97.0	98.5/ 97.1	97.2/ 97.1	97.0	96.9	96.8	97.0	96.5	97.3
Output current																
	50°C ambient temperature															
	Continuous (3 x 200-240 V) [A]	1.5	1.9	3.5	6.8	9.6	13.0	19.8	23.0	33.0	53.5	66.6	79.2	103.5	128.7	153.0
	Intermittent (3 x 200-240 V) [A]	1.7	2.1	3.9	7.5	10.6	14.3	21.8	25.3	36.3	58.9	73.3	87.1	113.9	141.6	168.3

1) At rated load conditions

Frequency converter		PK37	PK75	P1K5	P2K2	P3K0	P4K0	P5K5	P7K5	P11K	P15K	P18K	P22K	P30K	P37K	P45K	P55K	P75K	P90K
Typical shaft output (kW)		0.37	0.75	1.5	2.2	3.0	4.0	5.5	7.5	11.0	15.0	18.5	22.0	30.0	37.0	45.0	55.0	75.0	90.0
Typical shaft output (hp)		0.5	1.0	2.0	3.0	4.0	5.0	7.5	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0	70.0	100.0	125.0
IP20 frame		H1	H1	H1	H2	H2	H2	H3	H3	H4	H4	H5	H5	H6	H6	H6	H7	H7	H8
Max. cable size in terminals (mains, motor) [mm²/AWG]		4/10	4/10	4/10	4/10	4/10	4/10	4/10	4/10	16/6	16/6	16/6	16/6	35/2	35/2	35/2	50/1	95/0	120/250MCM
Output current																			
 130BB632.10	40°C ambient temperature																		
	Continuous (3 x 380-440 V)[A]	1.2	2.2	3.7	5.3	7.2	9.0	12.0	15.5	23.0	31.0	37.0	42.5	61.0	73.0	90.0	106.0	147.0	177.0
	Intermittent (3 x 380-440 V) [A]	1.3	2.4	4.1	5.8	7.9	9.9	13.2	17.1	25.3	34.0	40.7	46.8	67.1	80.3	99.0	116.0	161.0	194.0
	Continuous (3 x 440-480 V)[A]	1.1	2.1	3.4	4.8	6.3	8.2	11.0	14.0	21.0	27.0	34.0	40.0	52.0	65.0	80.0	105.0	130.0	160.0
	Intermittent (3 x 440-480 V) [A]	1.2	2.3	3.7	5.3	6.9	9.0	12.1	15.4	23.1	29.7	37.4	44.0	57.2	71.5	88.0	115.0	143.0	176.0
Max. input current																			
 130BB633.10																			
	Continuous (3 x 380-440 V) [A]	1.2	2.1	3.5	4.7	6.3	8.3	11.2	15.1	22.1	29.9	35.2	41.5	57.0	70.0	84.0	103.0	140.0	166.0
	Intermittent (3 x 380-440 V) [A]	1.3	2.3	3.9	5.2	6.9	9.1	12.3	16.6	24.3	32.9	38.7	45.7	62.7	77.0	92.4	113.0	154.0	182.0
	Continuous (3 x 440-480 V) [A]	1.0	1.8	2.9	3.9	5.3	6.8	9.4	12.6	18.4	24.7	29.3	34.6	49.2	60.6	72.5	88.6	120.9	142.7
	Intermittent (3 x 440-480 V) [A]	1.1	2.0	3.2	4.3	5.8	7.5	10.3	13.9	20.2	27.2	32.2	38.1	54.1	66.7	79.8	97.5	132.9	157.0
Max. mains fuses		See 5.1.4 Fuses																	

Frequency converter	PK37	PK75	P1K5	P2K2	P3K0	P4K0	P5K5	P7K5	P11K	P15K	P18K	P22K	P30K	P37K	P45K	P55K	P75K	P90K
Estimated power loss [W], Best case/typical[1)]	13/15	16/21	46/57	46/58	66/83	95/118	104/131	159/198	248/274	353/379	412/456	475/523	780	893	1160	1130	1460	1780
Weight enclosure IP20kg]	2.0	2.0	2.1	3.3	3.3	3.4	4.3	4.5	7.9	7.9	9.5	9.5	24.5	24.5	24.5	36.0	36.0	51.0
Efficiency [%], Best case/Typical 1	97.8/97.3	98.0/97.6	97.7/97.2	98.3/97.9	98.2/97.8	98.0/97.6	98.4/98.0	98.2/97.8	98.1/97.9	98.0/97.8	98.1/97.9	98.1/97.9	97.8	97.9	97.1	98.3	98.3	98.3
Output current																		
	50°C ambient temperature																	
	Continuous (3 x 380-440 V) [A]	1.04	1.93	3.7	4.85	6.3	8.4	10.9	14.0	20.9	28.0	34.1	38.0	48.8	58.4	72.0	74.2	102.9	123.9
	Intermittent (3 x 380-440 V) [A]	1.1	2.1	4.07	5.4	6.9	9.2	12.0	15.4	23.0	30.8	37.5	41.8	53.7	64.2	79.2	81.6	113.2	136.3
	Continuous (3 x 440-480 V) [A]	1.0	1.8	3.4	4.4	5.5	7.5	10.0	12.6	19.1	24.0	31.3	35.0	41.6	52.0	64.0	73.5	91.0	112.0
	Intermittent (3 x 440-480 V) [A]	1.1	2.0	3.7	4.8	6.1	8.3	11.0	13.9	21.0	26.4	34.4	38.5	45.8	57.2	70.4	80.9	100.1	123.2

1.7.3 Mains Supply 3 x 380-480 V AC

Frequency converter		PK75	P1K5	P2K2	P3K0	P4KO	P5K5	P7K5	P11K	P15K	P18K	P22K	P30K	P37K	P45K	P55K	P75K	P90K
Typical shaft output (kW)		0.75	1.5	2.2	3.0	4.0	5.5	7.5	11	15	18.5	22.0	30.0	37.0	45.0	55.0	75.0	90.0
Typical shaft output (hp)		1.0	2.0	3.0	4.0	5.0	7.5	10.0	15.0	20	25.0	30.0	40.0	50.0	60.0	70.0	100.0	125.0
IP54 frame		I2	I2	I2	I2	I2	I3	I3	I5	I5	I5	I6	I6	I6	I7	I7	I8	I8
Max. cable size in terminals (mains, motor) [mm²/AWG]		4/10	4/10	4/10	4/10	4/10	4/10	4/10	10/7	10/7	10/7	35/2	35/2	35/2	50/1	50/1	95/ (3/0)	120/ (4/0)
Output current																		
	40°C ambient temperature																	
	Continuous (3 x 380-440 V) [A]	2.2	3.7	5.3	7.2	9.0	12.0	15.5	24	32	37.5	44.0	61.0	73.0	90.0	106.0	147.0	177.0
	Intermittent (3 x 380-440 V) [A]	2.4	4.1	5.8	7.9	9.9	13.2	17.1	26.2	35.2	41.3	48.4	67.1	80.3	99.0	116.6	161.7	194.7
	Continuous (3 x 440-480 V) [A]	2.1	3.4	4.8	6.3	8.2	11.0	14.0	21	27	34	40.0	52.0	65.0	80.0	105.0	130.0	160.0
	Intermittent (3 x 440-480 V) [A]	2.3	3.7	5.3	6.9	9.0	12.1	15.4	23.1	29.7	37.4	44.0	57.2	71.5	88.0	115.5	143.0	176.0
Max. input current																		
	Continuous (3 x 380-440 V)[A]	2.1	3.5	4.7	6.3	8.3	11.2	15.1	22	29	34	41.8	57.0	70.3	84.2	102.9	140.3	165.6
	Intermittent (3 x 380-440 V) [A]	2.3	3.9	5.2	6.9	9.1	12.3	16.6	24.2	31.9	37.3	46.0	62.7	77.4	92.6	113.1	154.3	182.2
	Continuous (3 x 440-480 V) [A]	1.8	2.9	3.9	5.3	6.8	9.4	12.6	19	25	31	36.0	49.2	60.6	72.5	88.6	120.9	142.7
	Intermittent (3 x 440-480 V) [A]	2.0	3.2	4.3	5.8	7.5	10.3	13.9	20.9	27.5	34.1	39.6	54.1	66.7	79.8	97.5	132.9	157.0
Max. mains fuses																		

Frequency converter		PK75	P1K5	PK2K2	PK3KO	PK4KO	PK5K5	PK7K5	PK11K	PK15K	P18K	P22K	P30K	P37K	P45K	P55K	P75K	P90K
Estimated power loss [W], Best case/typical[1)]		21716	46/57	46/58	66/83	95/118	104/131	159/198	242	330	396	496	734	705	927	1075	1425	1469
Weight enclosure IP54kg]		5.3	5.3	5.3	5.3	5.3	7.2	7.2	23	23	23	27	27	27	45	45	65	65
Efficiency [%], Best case/Typical 1		98.0/97.6	97.7/97.2	98.3/97.9	98.2/97.8	98.0/97.6	98.4/98.0	98.2/97.8	98	98	98	98.0	97.8	98.3	98.3	98.3	98.3	98.5
Output current																		
	50°C ambient temperature																	
	Continuous (3 x 380-440 V) [A]	1.93	3.7	4.85	6.3	8.4	10.9	14.0	19.2	25.6	30	35.2	48.8	58.4	63.0	74.2	102.9	123.9
	Intermittent (3 x 380-440 V) [A]	2.1	4.07	5.4	6.9	9.2	12.0	15.4	21.2	28.2	33	38.7	53.9	64.2	69.3	81.6	113.2	136.3
	Continuous (3 x 440-480 V) [A]	1.8	3.4	4.4	5.5	7.5	10.0	12.6	16.8	21.6	27.2	32.0	41.6	52.0	56.0	73.5	91.0	112.0
	Intermittent (3 x 440-480 V) [A]	2.0	3.7	4.8	6.1	8.3	11.0	13.9	18.5	23.8	30	35.2	45.8	57.2	61.6	80.9	100.1	123.2

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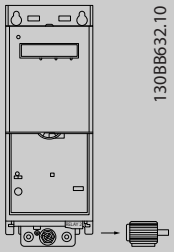
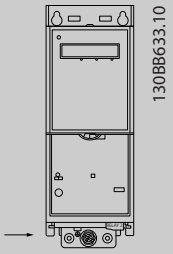
1.7.4 Mains Supply 3 x 525-600 V AC

Frequency converter	P2K2	P3K0	P5K5	P7K5	P11K	P15K	P22K	P30K	P45K	P55K	P75K	P90K
Typical shaft output (kW)	2.2	3.0	5.5	7.5	11.0	15.0	22.0	30.0	45.0	55.0	75.0	90.0
Typical shaft output (hp)	3.0	4.0	7.5	10.0	15.0	20.0	30.0	40.0	60.0	70.0	100.0	125.0
IP20 frame	H9	H9	H9	H9	H10	H10	H6	H6	H7	H7	H8	H8
Max. cable size in terminals (mains, motor) [mm²/ AWG]	4/10	4/10	4/10	4/10	10/8	10/8	35/2	35/2	50/1	50/1	95/0	120/ (4/0)
Output current												
 130BB632.10	**40°C ambient temperature**											
	Continuous (3 x 525-550 V) [A]	4.1	5.2	9.5	11.5	19.0	23.0	36.0	43.0	65.0	87.0	105.0	137.0
	Intermittent (3 x 525-550 V) [A]	4.5	5.7	10.5	12.7	20.9	25.3	39.6	47.3	71.5	95.7	115.5	150.7
	Continuous (3 x 551-600 V) [A]	3.9	4.9	9.0	11.0	18.0	22.0	34.0	41.0	62.0	83.0	100.0	131.0
	Intermittent (3 x 551-600 V) [A]	4.3	5.4	9.9	12.1	19.8	24.2	37.4	45.1	68.2	91.3	110.0	144.1
Max. input current												
 130BB633.10												
	Continuous (3 x 525-550 V) [A]	3.7	5.1	8.7	11.9	16.5	22.5	33.1	45.1	66.5	81.3	109.0	130.9
	Intermittent (3 x 525-550 V) [A]	4.1	5.6	9.6	13.1	18.2	24.8	36.4	49.6	73.1	89.4	119.9	143.9
	Continuous (3 x 551-600 V) [A]	3.5	4.8	8.3	11.4	15.7	21.4	31.5	42.9	63.3	77.4	103.8	124.5
	Intermittent (3 x 551-600 V) [A]	3.9	5.3	9.2	12.5	17.3	23.6	34.6	47.2	69.6	85.1	114.2	137.0
Max. mains fuses												
Estimated power loss [W], Best case/typical[1)]	8.4	112.0	178.0	239.0	360.0	503.0	607.0	820.0	972.0	1182.0	1281.0	1437.0
Weight enclosure IP54 kg]	6.6	6.6	6.6	6.6	11.5	11.5	24.5	24.5	36.0	36.0	51.0	51.0
Efficiency [%], Best case/Typical 1	97.0	97.0	97.0	97.0	97.0	97.0	97.5	97.5	98.0	98.0	98.4	98.5
Output current												
	50°C ambient temperature											
	Continuous (3 x 525-550 V) [A]	2.9	3.6	6.7	8.1	13.3	16.1	25.2	30.1	45.5	60.9	73.5	95.9
	Intermittent (3 x 525-550 V) [A]	3.2	4.0	7.4	8.9	14.6	17.7	27.7	33.1	50.0	67.0	80.9	105.5
	Continuous (3 x 551-600 V) [A]	2.7	3.4	6.3	7.7	12.6	15.4	23.8	28.7	43.3	58.1	70.0	91.7
	Intermittent (3 x 551-600 V) [A]	3.0	3.7	6.9	8.5	13.9	16.9	26.2	31.6	47.7	63.9	77.0	100.9

1.7.5 EMC Test Results

The following test results have been obtained using a system with a frequency converter, a screened control cable, a control box with potentiometer, as well as a motor screened cable.

RFI Filter Type	Conduct emission. Maximum shielded cable length (m)						Radiated emission			
	Industrial environment				Housing, trades and light industries		Industrial environment		Housing, trades and light industries	
	EN 55011 Class A2		EN 55011 Class A1		EN 55011 Class B		EN 55011 Class A1		EN 55011 Class B	
	Without external filter	With external filter	Without external filter	With external filter	Without external filter	With external filter	Without external filter	With external filter	Without external filter	With external filter
H4 RFI filter (Class A1)										
0.25-11 kW 3 x 200-240 V IP20			25	50		20	Yes	Yes		-
0.37-22 kW 3 x 380-480 V IP20			25	50		20	Yes	Yes		-
H2 RFI filter (Class A2)										
15-45 kW 3 x 200-240 V IP20	25						No		-	
30-90 kW 3 x 380-480 V IP20	25						No		-	
0.75-18.5 kW 3 x 380-480 V IP54	25						Yes			
22-90 kW 3 x 380-480 V IP54	25						No		-	
H3 RFI filter (Class A1/B)										
15-45 kW 3 x 200-240 V IP20			50		20		Yes		-	
30-90 kW 3 x 380-480 V IP20			50		20		Yes		-	
0.75-18.5 kW 3 x 380-480 V IP54			25		10		Yes			
22-90 kW 3 x 380-480 V IP54			50		10		Yes		-	

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Protection and features

- Electronic thermal motor protection against overload.
- Temperature monitoring of the heatsink ensures that the frequency converter trips in case of overtemperature.
- The frequency converter is protected against short-circuits between motor terminals U, V, W.
- If a motor phase is missing, the frequency converter trips and issues an alarm.
- If a mains phase is missing, the frequency converter trips or issues a warning (depending on the load).
- Monitoring of the intermediate circuit voltage ensures that the frequency converter trips if the intermediate circuit voltage is too low or too high.
- The frequency converter is protected against earth faults on motor terminals U, V, W.

Mains supply (L1, L2, L3)	
Supply voltage	200-240 V ±10%
Supply voltage	380-480 V ±10%
Supply voltage	525-600 V ±10%
Supply frequency	50/60 Hz
Max. imbalance temporary between mains phases	3.0% of rated supply voltage
True Power Factor (λ)	≥ 0.9 nominal at rated load
Displacement Power Factor (cosφ) near unity	(> 0.98)
Switching on the input supply L1, L2, L3 (power-ups) enclosure frame H1-H5, I2, I3	Max. 2 times/min.
Switching on the input supply L1, L2, L3 (power-ups) enclosure frame H6-H8, I6-I8	Max. 1 time/min.
Environment according to EN 60664-1	overvoltage category III/pollution degree 2
The unit is suitable for use on a circuit capable of delivering not more than 100.000 RMS symmetrical Amperes, 240/480 V maximum.	

Motor output (U, V, W)	
Output voltage	0 - 100% of supply voltage
Output frequency	0-200 Hz (VVC^{plus}), 0-400 Hz (u/f)
Switching on output	Unlimited
Ramp times	0.05 - 3600 sec.

Cable lengths and cross sections	
Max. motor cable length, screened/armoured (EMC correct installation)	See *1.7.5 EMC Test Results*
Max. motor cable length, unscreened/unarmoured	50 m
Max. cross section to motor, mains*	
Cross section DC terminals for filter feedback on enclosure frame H1-H3, I2, I3	4 mm^2/11 AWG
Cross section DC terminals for filter feedback on enclosure frame H4-H5	16 mm^2/6 AWG
Maximum cross section to control terminals, rigid wire	2.5 mm^2/14 AWG)
Maximum cross section to control terminals, flexible cable	2.5 mm^2/14 AWG)
Minimum cross section to control terminals	0.05 mm^2/30 AWG
*See tables for mains supply for more information	

Digital inputs:	
Programmable digital inputs	4
Terminal number	18, 19, 27, 29
Logic	PNP or NPN
Voltage level	0-24 V DC
Voltage level, logic '0' PNP	< 5 V DC
Voltage level, logic '1' PNP	> 10 V DC
Voltage level, logic '0' NPN	> 19 V DC
Voltage level, logic '1' NPN	< 14 V DC
Maximum voltage on input	28 V DC
Input resistance, R_i	Approx. 4 k
Digital input 29 as thermistor input	Fault: > 2.9 kΩ and no fault: < 800Ω

Analog inputs	
Number of analog inputs	2
Terminal number	53, 54
Terminal 53 mode	Parameter 6-19: 1 = voltage, 0 = current
Terminal 54 mode	Parameter 6-29: 1 = voltage, 0= current
Voltage level	0 - 10 V
Input resistance, R_i	approx. 10 kΩ
Max. voltage	20 V
Current level	0/4 to 20 mA (scalable)
Input resistance, R_i	<500Ω
Max. current	29 mA

Analog output	
Number of programmable analog outputs	2
Terminal number	42, 45[1)]
Current range at analog output	0/4 - 20 mA
Max. load to common at analog output	500 Ω
Max. voltage at analog output	17 V
Accuracy on analog output	Max. error: 0.4 % of full scale
Resolution on analog output	10 bit

1) Terminal 42 and 45 can also be programmed as digital outputs.

Digital output	
Number of digital outputs	2
Terminal number	42, 45[1)]
Voltage level at digital output	17 V
Max. output current at digital output	20 mA
Max. load at digital output	1 kΩ

1) Terminals 42 and 45 can also be programmed as analog output.

Control card, RS485 serial communication	
Terminal number	68 (P, TX+, RX+), 69 (N, TX-, RX-)
Terminal number	61 Common for terminals 68 and 69

Control card, 24 V DC output:	
Terminal number	12
Max. load enclosure frame H1-H8, I2-I8	80 mA

Relay output	
Programmable relay output	2
Relay 01 and 02	01-03 (NC), 01-02 (NO), 04-06 (NC), 04-05 (NO)
Max. terminal load (AC-1)[1)] on 01-02/04-05 (NO) (Resistive load)	250 V AC, 3A
Max. terminal load (AC-15)[1)] on 01-02/04-05 (NO) (Inductive load @ cosφ 0.4)	250 V AC, 0.2A
Max. terminal load (DC-1)[1)] on 01-02/04-05 (NO) (Resistive load)	30 V DC, 2A
Max. terminal load (DC-13)[1)] on 01-02/04-05 (NO) (Inductive load)	24 V DC, 0.1A
Max. terminal load (AC-1)[1)] on 01-03/04-06 (NC) (Resistive load)	250 V AC, 3A
Max. terminal load (AC-15)[1)] on 01-03/04-06 (NC) (Inductive load @ cosφ 0.4)	250 V AC, 0.2A
Max. terminal load (DC-1)[1)] on 01-03/04-06	30 V DC, 2A
(NC) (Resistive load)	Min. terminal load on 01-03 (NC), 01-02 (NO) 24 V DC 10 mA, 24 V AC 20 mA
Environment according to EN 60664-1	Overvoltage category III/pollution degree 2

1) IEC 60947 parts 4 and 5.

Control card, 10V DC output	
Terminal number	50
Output voltage	10.5 V ±0.5 V
Max. load	25 mA

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All inputs, outputs, circuits, DC supplies and relay contacts are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.

Surroundings	
Enclosure	IP20
Enclosure kit available	IP21, TYPE 1
Vibration test	1.0 g
Max. relative humidity	5% - 95% (IEC 60721-3-3; Class 3K3 (non-condensing) during operation
Aggressive environment (IEC 60721-3-3), coated (standard) frame H1-H5	Class 3C3
Aggressive environment (IEC 60721-3-3), non-coated frame H6-H10	Class 3C2
Aggressive environment (IEC 60721-3-3), coated (optional) frame H6-H10	Class 3C3
Test method according to IEC 60068-2-43 H2S (10 days)	
Ambient temperature	See max. output current at 40/50° C in the tables mains supply

Derating for high ambient temperature, see section on special conditions

Minimum ambient temperature during full-scale operation	0° C
Minimum ambient temperature at reduced performance, enclosure frame H1-H5	-20° C
Minimum ambient temperature at reduced performance, enclosure frame H6-H10	-10° C
Temperature during storage/transport	-30 - +65/70° C
Maximum altitude above sea level without derating	1000 m
Maximum altitude above sea level with derating	3000 m
Derating for high altitude, see section on special conditions	
Safety standards	EN/IEC 61800-5-1, UL 508C
EMC standards, Emission	EN 61800-3, EN 61000-6-3/4, EN 55011, IEC 61800-3
EMC standards, Immunity	EN 61800-3, EN 61000-3-12, EN 61000-6-1/2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6

1.8 Special Conditions

1.8.1 Derating for Ambient Temperature and Switching Frequency

The ambient temperature measured over 24 hours should be at least 5°#C lower than the max. ambient temperature. If the frequency converter is operated at high ambient temperature, the continuous output current should be decreased. For derating curve, please see Design Guide MG18C3YY.

1.8.2 Derating for Low Air Pressure

The cooling capability of air is decreased at low air pressure. For altitudes above 2000 m, please contact Danfoss regarding PELV. Below 1000 m altitude no de-rating is necessary, but above 1000 m the ambient temperature or the maximum output current should be decreased. Decrease the output by 1% per 100 m altitude above 1000 m or reduce the max. ambient temperature by 1° per 200 m.

1.9 Options for VLT HVAC Basic Drive FC101

For options please see the Design Guide MG18C3YY.

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